1982 FIELD SERVICE ANNUAL REPORT

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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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OFFICES

Headquarters
1943 Landings Drive
Mountain View, CA 94043
(415) 960-3990
Telex 171407

Dallas
Campbell Center II
8150 N. Central Expressway
Dallas, Texas 75206
(214) 691-8565

New York
Park 80 Plaza West-I
Saddle Brook, New Jersey 0766[...]
(201) 368-9471

United Kingdom
INPUT, Ltd.
Airwork House (4th Floor)
35 Piccadilly
London, W.1.
England
01-439-4442
Telex 269776

Japan
Overseas Data Service Company, Ltd.
Shugetsu Building
No 12 – 7 Kita Aoyama
3–Chome Minato-ku
Tokyo, 107
Japan
(03) 400–7090
Telex J26487

[...]eden
[...]. Persson Konsult AB
[...] 221 14
[...]tverkargatan 7
[...] 22 Stockholm
[...]eden
[...]52 07 20

INPUT Planning Services for Management

1982 FIELD SERVICE ANNUAL REPORT

SEPTEMBER 1982

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1982 FIELD SERVICE ANNUAL REPORT

EXHIBITS

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I INTRODUCTION

I   INTRODUCTION

- This 1982 Field Service Annual Report is designed to be a data base of industry trends and reference material to assist field services management in market planning. The report provides clients with a comprehensive overview of user attitudes and requirements, contrasted with vendor activities and concerns.

- The sources of infomation for the report were:

    - Mail, telephone, and on-site interviews with 45 vendors of equipment and third-party maintenance service organizations, as shown in Exhibit I-1.

    - Mail and telephone interviews of 306 users of mainframe computers, small business systems, minicomputers, microcomputers, peripherals, terminals, word processors, executive workstations, and data communications equipment. Exhibit I-2 details the industry sector and user company size samples.

    - INPUT's library of vendor and market information.

- Vendor interviews were conducted with principals in charge of company field service operations in the United States. Titles varied:

    - Director Corporate Planning, Field Engineering - 7%.

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EXHIBIT I-1

VENDORS INTERVIEWED

COMPANY	MAINFRAME	SMALL BUSINESS SYSTEM	MINICOMPUTERS	MICROCOMPUTERS	PERIPHERALS	TERMINALS	WORD PROCESSORS	EXECUTIVE WORK STATIONS	DATA COMMUNICATIONS
A. B. Dick					•	•	•	•	
Apple Distribution				•					
Applied Data Communications			•						
Astrocom		•							•
Beehive						•			
Bell and Howell	•	•	•	•	•				
Calcomp	•				•				
Cambex	•								
Centronics					•				
Control Data	•	•	•	•	•	•			•
Computer Automation		•	•						
Computer Communications									•
CFE		•	•	•	•	•	•	•	•
Data General	•	•	•	•	•	•	•	•	
Decision Data		•	•	•	•	•		•	
Delta Data						•			
Diablo Systems					•				
Floating Point	•		•						
Four Phase			•						
General Datacom									•
Hewlett Packard	•	•	•	•	•	•		•	
Honeywell	•	•	•		•	•	•		•
Indeserve		•	•	•	•	•	•	•	•

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EXHIBIT I-1 (CONT.)

VENDORS INTERVIEWED

COMPANY	MAINFRAME	SMALL BUSINESS SYSTEMS	MINICOMPUTERS	MICROCOMPUTERS	PERIPHERALS	TERMINALS	WORD PROCESSORS	EXECUTIVE WORK STATIONS	DATA COMMUNICATIONS
ITT Courier				•	•				•
3M		•				•	•		
Modular Computer			•		•				•
NAS	•								
NBI							•		
Northern Telecom		•			•	•			•
Olivetti		•	•	•					
Paradyne			•	•	•	•	•	•	•
Printronics					•				
QI		•							
Raster Technologies					•				
Rolm									•
Scandata		•			•	•			
Siemens						•			
Storage Technology					•				
Stratus			•						
Tektronix						•			
Telegenics			•		•	•			
Triad		•	•						
TRT Data Products			•						
TRW		•	•	•	•	•	•	•	•
Xerox							•		
TOTALS	9	17	20	11	22	19	10	8	13

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EXHIBIT I-2

USER INTERVIEWS -
CELL SIZE

INDUSTRY SECTOR	COMPANY SIZE			
	SMALL ≤$100M	MEDIUM >$100M– ≤$250M	LARGE >$250M	TOTAL
Discrete Manufacturing	13	11	15	39
Process Manufacturing	10	10	17	37
Transportation	7	3	9	19
Utilities	4*	4*	12	20
Banking and Finance	4*	4*	17	25
Insurance	13	5	7	25
Medical	9	9	3	21
Education	8	4	4	16
Retail	9	5	11	25
Wholesale	8	8	10	26
Federal Government	1*	4	4	9
State and Local Government	8	6	3	17
Services and Other	19	2[†]	6[†]	27
TOTAL	113	75	118	306

* Industry sector composed principally of large corporations.
† Industry sector composed principally of small corporations.

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- Director, Field Engineering (or equivalent) - 48%.

- Vice President, Field Service (or equivalent) - 23%.

- Manager, Service Marketing (or equivalent) - 7%.

- User interviews were conducted with DP managers or directors of operations. A balance of interviews was attempted among small (less than $100M), medium ($100 to $250M), and large (more than $250M) corporations, but in some cases this was not possible due to the structure of the particular industry:

  - Banks are principally large groups.

  - Process manufacturing groups are either large or small; medium-sized corporations are difficult to find.

  - Educational groups fall largely in the small category.

- INPUT believes the user sample is a fair representation of the structure of U.S. business.

- In addition to the issues treated in the 1981 Field Service Annual Report, several new areas of vendor concern are examined:

  - The environment in which equipment is used (DP room, office, factory or plant).

  - Analysis of user EDP expenditures and budgets for maintenance in 1982 and planned spending for 1983.

  - User requirements by equipment category.

  - Vendor field service performance in 1981-1982.

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- Vendor case studies (anonymous).

- Vendor future plans and developments.

- The report continues INPUT's research and analysis in the area of field service, initiated in INPUT's 1978 multiclient study, <u>Maintenance Require-ments for the Information Processing Industry</u>. The overall methodology is presented in Exhibit I-3.

- The data used in this report represent authorized disclosures by users and vendors alike. Data presented on sensitive issues such as vendor revenue are either from annual reports, 10-Ks, or INPUT estimates. Elsewhere confiden-tial data are presented in summary form only, to protect the identity of the individual contributors.

- To encourage wide distribution of the principal findings of this report, clients are provided with additional copies of the Executive Summary and the report's full table of contents.

- Inquiries and comments from clients are invited, both on the context of this report and related topics that clients wish to examine in greater depth.

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EXHIBIT I-3

METHODOLOGY USED IN THE FIELD SERVICE PROGRAM

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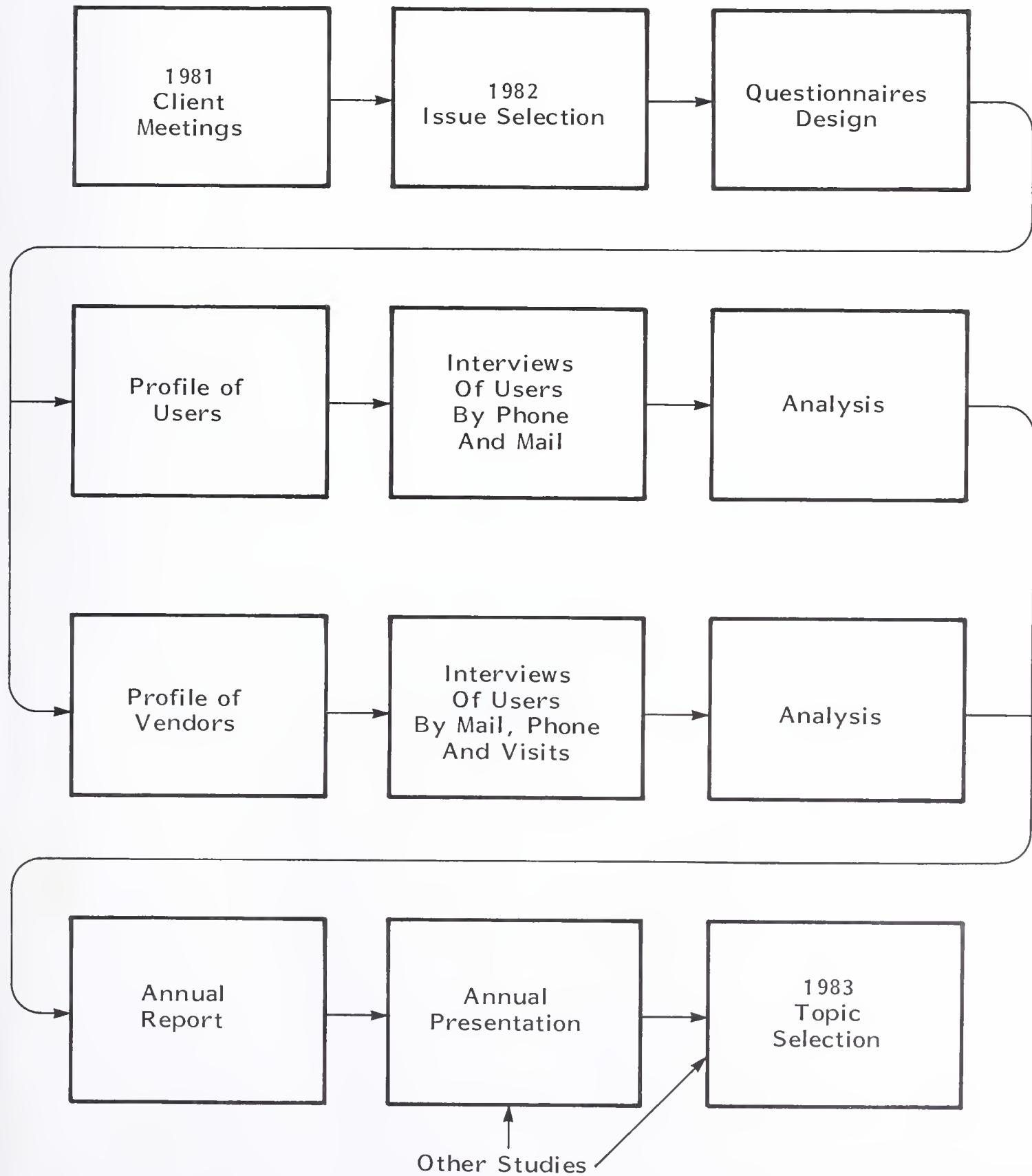
II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. 1982 IN PERSPECTIVE

- The fundamental changes in the complexion of the information processing industry, already visible in the 1980-1981 business period, are continuing in the 1981-1982 period:

    - Office automation and distributed processing systems are gradually replacing mainframes as the main source of new business revenue.

    - Services (e.g., maintenance, training, software, systems support) continue to expand their share of the revenue pie chart.

    - The performance overlap of minicomputers and mainframe systems at the high end and of microcomputers and minicomputers at the low end continues to grow.

    - The need for vertical market products (hardware and software) and corresponding sales, marketing, and support skills to maintain historic growth rates is driving vendors to expand their product lines.

    - Competition for all major sectors of business in a shrinking economy is hardening.

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- The lack of quality information systems professionals needed to sustain and expand business growth in line with emerging niche market strategies continued to be a limiting factor.

- One by one, the main computer vendors have realized that the definition of information systems supplier has expanded beyond traditional small, medium, and large systems and their associated peripheral complements, to include office automation, networking, and communications products.

- All of the vendors shown in Exhibit II-1 have implemented a network strategy, either of their own design or in line with one of the developing standards such as SNA; of these, only Amdahl has no office automation offering.

- The economy downturn in late 1981 - early 1982 shrank the revenue and net income growth of nearly all vendors, the exceptions being those who were rebounding from poor 1980 results (i.e., where 1979-1980 growth in revenue and net income was below par).

B. REVENUE GROWTH AND FORECAST

- Average information systems vendor revenue growth in 1980 was 16%; in 1981 it dropped to 13%. This is nevertheless a good result, demonstrating the strength of the information systems industry in the worst economic conditions since the depression.

- Total revenue from services (including field service, software, training, professional services, and systems support) grew 17.5% in 1981, faster than information systems vendor total revenue. Field service revenue, on average, represented 18% of all information systems revenue (in some individual companies as high as 28%), as shown in Exhibit II-2.

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EXHIBIT II-1

KEY VENDOR FINANCIAL PERFORMANCE

COMPANY	FISCAL YEAR END	TOTAL INFORMATION SYSTEMS REVENUE ($ millions)		REVENUE GROWTH (percent)		NET INCOME GROWTH (percent)	
		1981	1980	1980/1981	1979/1980	1980/1981	1979/1980
IBM	12/31	29,070	26,213	11	15	(7)	18
NCR	12/31	3,433	3,322	3	11	(18)	8
Burroughs	12/31	3,405	2,903	17	3	82	(74)
DEC	6/29	3,'198	2,368	35	31	37	40
CDC	12/31	3,101	2,766	12	23	31	40
Sperry Univac	3/31	2,707	2,319	17	13	21	27
Honeywell	12/31	1,774	1,634	9	13	(14)	22
Hewlett Packard	10/31	1,771	1,510	17	42	12	56
Wang	6/30	856	543	58	69	50	82
Data General	9/26	737	654	13	29	(8)	10
Amdahl	12/25	443	394	12	23	76	(1)
Datapoint	7/31	396	319	24	37	46	33
Four Phase	12/31	234	197	19	10	31	(67)

Source: 1981 Annual Reports

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EXHIBIT II-2

KEY VENDOR 1981 SERVICE REVENUE

COMPANY	FISCAL YEAR END	TOTAL INFORMATION SYSTEMS REVENUE ($ millions)	ESTIMATED EDP SERVICE AND SOFTWARE REVENUE ($ millions)	SERVICE REVENUE (percent) GROWTH 1980/1981	ESTIMATED FIELD SERVICE REVENUE ($ millions)		FIELD SERVICE AS PERCENT OF TOTAL REVENUE 1981
					U.S.	FOREIGN	
IBM	12/31	29,070	5,812	20	2,740	1,910	16
NCR	12/31	3,433	1,029	8	394	429	24
Burroughs	12/31	3,405	1,201	13	503	338	25
DEC	6/29	3,198	814	38	371	239	19
CDC	12/31	3,101	1,112	13	212	44	8
Sperry Univac	3/31	2,707	864	9	414	346	28
Honeywell	12/31	1,774	620	9	213	230	25
Hewlett Packard	10/31	1,771	600	17	199	191	22
Wang	6/30	856	96	91	74	36	13
Data General	9/26	737	148	42	73	45	16
Amdahl	12/25	443	128	12	69	46	26
Datapoint	7/31	396	69	17	48	11	15
Four Phase	12/31	234	57	22	50	4	23

Source: 1981 Annual Reports, 10-K, INPUT Estimates

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- The service and software revenue presented in Exhibit II-2 next to total information systems revenue is an estimate of the contributions of field service, software (generally, though not always exclusively, system software), training, professional services, and systems support.

- The vendors listed do not report revenue for these services in a homogeneous manner, sometimes adding lease revenue from equipment, for example. The estimates presented are net of such lease revenue.

- Individual vendor performances varied enormously in 1981. Service revenue growth ranged from 8% to 91%. The circumstances surrounding these values qualify the results; they are not directly comparable.

- Wang's enormous increase in services revenue was due to (i) a small 1980 revenue base; (ii) very rapid growth of the installed base (again from a modest base). Field service revenue at Wang is a small 13% of the total, a fact perhaps not entirely unrelated to the company's poor service reputation.

- The minicomputer companies' rapid growth led to important growth in field service revenue (e.g., DEC - 38%, Data General - 42%, Four Phase - 22%).

- Of the mainframe systems suppliers, IBM returned a powerful performance in increasing service revenue by 20%, while total revenue grew by only 11%.

1. FIELD SERVICE REVENUE GROWTH, 1981-1982

- Field service revenue is expected to grow at 17.8% in the calendar year 1982 (from a base of $7,750 million in 1981) as a slow economic recovery begins in the third quarter of the year.

- Actual growth rates for individual vendor field services revenue will range widely from as little as 9% to as much as 40%.

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- IBM's 34.5% share in the 1981 U.S. field service market is estimated to grow at 20% per annum, or slightly faster than the industry average. Approximately 12% of this net growth will come from price increases; the remaining 8% is from net additions to the installed base.

2. FORECAST FIELD SERVICE REVENUE GROWTH, 1982-1987

- Two factors are conspiring to hold back the rate of growth of field service revenue in both the short and long term:

    - Flat equipment sales due to a worsening of U.S. economy, which was initially anticipated to have only short-term impact (but is now expected to affect the medium term also).

    - Improved reliability in new products will allow a reduction in field service charges from the older product lines (which will be emphasized as a competitive factor by marketing); this affects a broader and broader range of products (and a larger and larger slice of field service revenue).

- As a result, the 1982 to 1987 growth forecast in Exhibit II-3 is at a slightly slower rate than that predicted in the 1981 Annual Report (19.8%, down from 20%).

- Field service revenue per field engineer improved in 1981 due to increased efficiency of new maintenance techniques, and is expected to grow at 13.4% per annum. In 1981 the revenue per engineer was higher than the billing rates of management consultants in the computer services industry.

- The number of field service personnel in the industry is anticipated to grow at only 6%, the result of better overall productivity and equipment reliability.

- As the installed base migrates to newer products with lower maintenance costs, revenue growth will slow. This implies that field service management

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EXHIBIT II-3

FORECAST FIELD SERVICE REVENUE
AND PERSONNEL GROWTH, 1982-1987

YEAR	FIELD SERVICE REVENUE ($ millions)	FIELD MAINTENANCE PERSONNEL (thousands)	REVENUE PER FIELD MAINTENANCE PERSON ($ thousands)
1981	$7,750	136	$56.9
1982	9,130	147	62.1
1983	10,990	157	70.0
1984	13,460	166	81.1
1985	15,960	175	91.2
1986	19,320	184	105.0
1987	22,890	193	118.6
AAGR (percent)	19.8%	6.0%	13.0%

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needs to reorient its maintenance strategy to target new service growth areas now (see II-E, Strategies).

3.   TREND ANALYSIS OF FAULT CALL COSTS

- A summary analysis of how fault call costs are expected to change over the next 12 months shows that field service is the most likely target for cost cutting, as shown in Exhibit II-4.

- The proportion of per call costs dedicated to burden/overhead parts and materials is expected to rise by 3% in 1983 while all other areas are either steady or decreasing.

- Simultaneously, travel expense is expected to drop sharply. Both developments are in line with the continued implementation of support centers and remote diagnostics.

- Direct and travel labor, for similar reasons, are being held at near-1981 levels:

    - Productivity is improving, and the number of calls handled per engineer is increasing.

    - Salary raises are being held at 1981 levels, or around 10%, as shown in Exhibit IV-13.

    - Travel time is being reduced.

- The average cost of a call is expected to rise by only 5.9% in 1983, while calls per engineer will increase by 10.6%, so that margin improvements will result.

- The per call costs in actual dollars, by equipment category, are shown in Exhibit II-5. The areas of greatest productivity improvements show up in the cost increases expected.

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EXHIBIT II-4

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TREND ANALYSIS OF COST BREAKDOWN
OF A TYPICAL FAULT CALL

COMPONENT	1982	1983 (percent change over 1982)
Average Cost (dollars)		+ 5.9%
Direct Labor (percent)		− 0.3
Travel Labor (percent)		+ 0.9
Parts and Materials (percent)		+ 0.9
Travel Expense (percent)		− 4.5
Burden/Overhead (percent)		+ 3.0
Number of Calls per Week		+10.6%

(1982 column: REFERENCE YEAR)

Source: Vendor Interviews

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EXHIBIT II-5

AVERAGE FAULT CALL COSTS
1982 (ACTUAL) AND 1983 (EXPECTED)

EQUIPMENT CATEGORY	1982 ($, per call)	1983 ($, per call)	CHANGE (percent)
Mainframes	$307	$331	+ 7.8%
Small Business Systems/ Minicomputers	245	247	+ 0.8
Peripherals	129	136	+ 5.4
Terminals	132	147	+11.4

Source: Vendor Interviews

- Small business systems and minicomputer vendors will benefit most from support center/remote diagnostic efficiencies.

- Mainframe and peripheral vendors cannot escape on-site visits even though remote fault finding improves previsit spares selection.

- Terminal vendors do not yet benefit from on-line fault isolation and they suffer from a growing geographic dispersion of the units to be maintained.

4. PLANNED INCREASES IN CALL CHARGE RATES

- On the other side of the coin, charge rates on nearly all categories of equipment are expected to rise, as shown in Exhibit II-6.

- Mainframe vendor charges, already higher than any other category, will have the highest increase in per call charge rates.

- The markets with the most severe competition will have the lowest maintenance rate increases.

    - Small business systems (a very tough market).

    - Minicomputer systems (until now a buoyant market but beginning to see some slackened demand along with increased competition).

    - Word processors (potentially a huge market and certainly a strong growth area under normal economic conditions).

- Planned charge rate increases parallel the call cost increases fairly precisely, with some additional margin included:

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EXHIBIT II-6

PER CALL CHARGE RATES
BY EQUIPMENT CATEGORY

CATEGORY	AVERAGE HOURLY RATE ($)		CHANGE (percent)
	1982	1983 (Plan)	
Mainframes	$93.60	$113.50	+21%
Small Business Systems	57.63	58.05	+0.7
Minicomputers	74.55	76.83	+3.1
Microcomputers	65.00	70.50	+8.5
Peripherals	87.00	96.00	+10
Terminals	59.29	65.00	+9.6
Word Processors	60.00	62.75	+4.6
Data Communications	50.00	56.00	+12

Source: Vendor Interviews

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Category	Call Cost % Increase	Call Charge % Increase	Difference
- Mainframe	7.8	21.0	+13.2
- Small Business/ Minicomputers	0.8	1.9 (average)	+1.1
- Peripherals	5.4	10.0	+4.6
- Terminals	11.4	9.6	-1.8

5.   GROWTH OF SOFTWARE MAINTENANCE

- System software maintenance, now commonly (though not solely) the responsibility of the field service organization, has yet to be fully exploited as a revenue base:

    - Only partial site development has been achieved for all the system software options available on the hardware.

    - Many system software items have service charges that are inappropriate to the ongoing development and error correction needed at the item's particular stage of development.

    - Once the configuration sale has been made, salesmen do not target system software sales, unless the user requests them or a particular hardware upgrade demands them.

- IBM alone has been successful in marketing system software. Indeed, the complexity of options has resulted in overkill of user requirements in some cases (e.g., 4300 series where system software library options need careful user screening if they are to be deleted from the chargeable items list).

- As vendors become more adept at focusing on this opportunity, system software sales (and the maintenance revenue that goes with them) will rapidly increase over the 1983-1984 period.

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- Simultaneously, maintenance charges for these items will be brought in line with development and maintenance activities, raising the overall revenue base by as much as 25% to 35% above equivalent 1982 charges.

- The combination of these two forces plus the growth of the equipment installed base will double system software maintenance revenue over the next two years.

- Field service management must carefully stage the user base from one major system software release to another in synchronism with the major hardware charge levels (field charge orders). This will be easier for on-site field service personnel to do than remote software support personnel, as in the past.

C. THE USER ENVIRONMENT

- Field service managers must understand the user's environment and needs, beyond the traditional preoccupation with service levels and equipment performance, if they intend to plan their activities and strategies rather than react to everyday events in a fire-fighting mode.

- Looking at planned user EDP expenditures in each of the equipment categories serviced shows what service requirements will be in terms of contract types, engineer skill mix, and spares holding.

1. USER EXPENDITURES GROWTH, 1982-1983

- User expenditures are analyzed in more detail in Section III-1 of this report, but a summary is provided in Exhibit II-7.

- Two things must be borne in mind when analyzing exhibits such as this:

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EXHIBIT II-7

EDP EXPENDITURES GROWTH
BY CATEGORY, 1981-1982
(All Sectors)

EQUIPMENT CATEGORY	RESPONDENTS AVERAGE BUDGET ROUNDED ($ thousands)	PERCENT OF COMPANIES WITH:		NET CHANGE 1981/1982 (percent)
		INCREASE	DECREASE	
Mainframes	767	80	20	+11
Minicomputers	258	97	3	+27
Micro/Personal	39	95	5	+59
Terminals	598	87	13	+14
Peripherals	366	94	6	+28
Communications HW/SW	157	94	6	+16

Source: 128 User Responses

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-       The respondent's average budget indicates typical spending on each equipment category, but it is most useful when combined with the net change 1982-1983, to produce incremental (new) dollar spending.

-       The net change percentage only indicates growth rate - not necessarily those areas that contribute the most dollars.

• For example, the highest net growth area in 1983 will be the microcomputer/ personal computer area - but it represents only 6% of new dollar spending, since the growth starts from a small average budget. It is in fact the smallest increment in the 1983 budgetary increase.

2.   USER CONCERN WITH RELIABILITY

• Of all the field service-related issues that users consider when choosing equipment, system reliability (i.e., software and hardware reliability) is the most important.

• This concern easily outweighs vendor reputation and the cost of field service. Users are clearly prepared to pay extra for quality products they can rely on to perform consistently.

3.   PREFERENCE FOR ON-SITE MAINTENANCE

• As more and more low cost products enter the market, vendors are looking to compromise with field service support, by varying combinations of remote fault analysis, customer self-help, carry-in service, and the like.

• However, a recent INPUT study of low-cost equipment maintenance showed that users would prefer to have on-site service, even though this calls for annual expenditures up to 25% of the list price of the product.

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- Vendors should therefore concentrate on analyzing profitable ways of providing the maintenance service users want, rather than assuming that service charges will frighten the customer away.

4. INFLUENCE OF FIELD SERVICE ENGINEERS ON USER SPENDING

- Users often think the field service engineer's technical knowledge makes him an EDP specialist, and they follow his opinion on what to buy and when.

- This gives vendors the opportunity to gain valuable insight into users' spending plans and to influence purchase decisions that might otherwise go against the vendor, or be postponed.

- Used responsibly and with the user's long-term good in mind, the field service workforce can contribute constructively to vendor sales planning.

D. THE VENDOR ENVIRONMENT

1. FUTURE INTEGRATION OF OFFICE PRODUCTS WITH INFORMATION SYSTEMS

- Changes in product mix have been a constant preoccupation of field service managers in one form or another:

  - Application of new technologies affecting parts of the installed base.

  - Introduction of new technology versions of existing products.

  - Introduction of new products, whether for existing markets or new ones.

- These constant changes place demands on all aspects of field service from spare parts management to field engineer training. They normally occur,

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however, within the markets and product line that field service management knows intimately.

- Within the next five years, many field service organizations will face a challenge of another order: <u>the integration of office products with informa-</u> <u>tion systems.</u>

- This is not the merger of two industries of equal maturity. The office products market, only in its infancy, has not progressed beyond an initial attempt at office automation.

- Office automation is defined as the application of a set of products and services to improve existing paper-based office procedures. The office of the future will contain products and services that require fundamental changes in existing office procedures.

- Experience to date suggests that office automation is the first, necessary step in the office of the future. Automation shows that a communications network must be set up to allow the separate parts of the automated office to communicate with each other.

- At that point the EDP manager steps in:

  - Networks are his province.

  - Office automation expenditures will have reached a size equivalent to 25% to 30% of EDP expenditures.

  - "The company needs an integrated information handling plan and management."

- This stage is already visible in large user sites, resulting in the creation of the post of "Vice President of Information Processing," or equivalent whose

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responsibilities are being defined along market sector lines as opposed to product lines.

- At the field service level, this creates the same difficulties that users are facing:

    - The field service manager responsible for information systems has no experience of the needs of office products.

    - The user EDP manager has no experience of the needs of the office products users.

- The need, therefore, is less for technical ability than for management understanding (and setting the right direction).

2. CHANGE IN PRODUCT MIX

- The office products integration problem is still some way off for most field service managers interviewed. One problem already here, however, is the rapidly changing product mix in information systems.

- Vendors of compatible lines of mainframe products have had to contend with the rapid increase in power and software capability of the minicomputer. The mini also introduced distributed processing, a necessary corollary of which was networking. Both caused fundamental changes in field service requirements.

- Technology improvements have continued, and the microcomputer is now bringing a second wave of change to information systems, extending the concept of distributed processing to individual users (as opposed to groups of users).

- Two revolutionary products have resulted from this:

    - The personal computer.

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- The executive workstation.

- Both supply local processing power and storage to the individual user; both rely on software to determine their role, and neither needs remote processing power to become functional (as, for example, terminals do).

- Because of all these changes, maintenance strategies must be revised to accommodate:

  - Low-cost products.

  - Wide geographic product dispersion.

  - Need to preserve the standard of service.

  - Distributor networks.

  - Need for maintained or improved profit levels.

3.   CHANGE IN MAINTENANCE STRATEGIES

- Vendors have met the challenge in a variety of ways, including:

  - Attempts at educating the user to use central repair shops and "return for repair" contracts.

  - Adding additional tiers of response levels/types of contracts.

  - Test marketing third-party module repair/delivery service.

  - Partial user self-maintenance.

  - Redundant hardware left on-site (e.g., extra terminal).

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- User-purchased spares.

- Software support centers.

- Remote diagnostic centers.

- Facilities management service (of <u>all</u> equipment on-site from multiple vendors).

- Many vendors' cost control procedures still do not allow accurate monitoring of the impact of low-cost products on overall costs, and they are therefore not sure how big the problem is.

- Most vendors realize the need for accuracy, however. They have established or delegated profit center responsibility within the field service organization, and extended cost- and revenue-tracking all the way down to "site within customer" (see Sections IV-1-5 and 6).

- Organizing for these changes in maintenance strategies is not easy, because it strikes at the heart of the traditional field service engineer skills profile.

4. PERSONNEL POLICIES

- The product mix changes, the move towards part exchange/board swapout, and the establishment of software support centers and remote diagnostic centers are changing the nature and level of expertise field service organizations require:

    - Small number of highly specialized, highly experienced professionals to man support centers.

    - Many nonspecialized, low-level skilled engineers for site visits.

INPUT

- Small number of highly skilled engineers for on-site customer residency, where required.

- Small number of highly experienced spares center, diagnostic center, and software support center managers.

- Small cadre of financial administrators and planners.

- Many of the administrative and managerial skills needed for these new structures will not be found in the current field service force. Promoting good engineers into managerial positions is usually a double disaster, turning a good engineer into a mediocre manager.

- Clear personnel policies that enable the current field service force to understand the changes that are carried out are vital to successful creation of the new structure. Otherwise dissatisfaction, defection, and widespread loss of morale can result in a confused field service staff.

E.   RECOMMENDATIONS

1.   LONG-RANGE PLAN

- Today's field service manager must develop his long-range strategy plan with important considerations in mind:

  - Shorter average product life for all products.

  - Accelerating change of product mix.

  - Increased responsibility of field service to overall company profitability.

  - Increased shortage of skilled manpower.

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- IBM's new wave of aggression in all of its markets and its willingness to respond to competitive challenge with new technology products has accelerated product introduction from all vendors. This has resulted in a bewildering array of new, quasi-new, and patched-up (old) products on the market at a time of reduced sales and increased competition.

- From the field service manager's standpoint this means more small-volume specialized products with short sales lives which are added to the installed base. This is the exact contrary of the ideal service environment of a small number of very high-volume, standard products.

- This accelerating change of product mix has its impact on personnel skill mix, which must be planned for. Like it or not, the field service manager will also face company demands for still higher revenue and profit levels, and he should plan for these. Hardware maintenance prices can be increased without excessive user reaction, if each price increase is accompanied by perceived service improvements. These must be identified and planned for.

- Software maintenance revenue can also contribute heavily. Today's system software maintenance is vastly underpriced.

- Productivity plans must be constantly reviewed, in the light of the need for improved profit levels and the continued shortage of skilled manpower.

2. FIELD QUALITY ASSURANCE (FQA)

- Quality commands a premium. It also improves morale of the user base and the company workforce. Quality audits should be standard procedure for all field service organizations.

- While it is normal for field service managers to expect that personnel are concerned with quality, it is important to demonstrate management's preoccu-

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pation with this issue. Field staff must have the assistance and tools they need to improve their performance.

- FQA also demonstrates that vendor management believes users have a right to expect equipment to perform to specification, and to insure that all field charge orders (FCOs) are implemented.

- It also provides management with the opportunity to vet contracts, equipment and parts inventories, branch manpower loading, reporting procedures, and communications with support center and headquarters staff.

- Finally, the summary of FQA data guides management toward real problem-solving (as opposed to inventing new procedures that simply add to the backlog of nonfunctioning controls).

3. THIRD-PARTY MAINTENANCE (TPM)

- The concept of field service has been expanded from an overhead cost to a profit center. Well and good, but field service can go far beyond that.

- Where an existing field service network has service skills that match products commonly found in a vendor's user base (or even another user base that is complementary in terms of market, sector or long-term company goal), there is an opportunity to offer TPM service to that product base.

- This may be accomplished in contractual agreement with the manufacturer of the product or in competition with him. In all cases it should fulfil a total service and support role to the user base, compatible with the vendor company's business goals.

- Field service is accepted as a product. It should therefore be sold as such, aggressively and to the widest market possible.

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- Arguments against such an approach that are based on "impacting the quality of service to our own users" must be expected - and refuted.

- Taking on an existing customer base of new products whose detailed composition and location are known in advance is far more profitable (and easier) than supporting of a new sales campaign, which will produce installations at unknown intervals at unknown locations in unknown configurations.

4.   SOFTWARE MAINTENANCE

- Systems software maintenance is a growing component of total service revenue (and will grow all the faster when prices are more compatible with the service rendered).

- Another aspect of software maintenance to examine is that of application software, where the application is frozen in specification and requires substantial integration with systems software.

- In areas where this is possible, integrated maintenance support can cover hardware, systems software, and application software.

- Some vendors are beginning to offer application packages in vertical markets such as manufacturing, banking, and transportation (airlines mainly). In these areas, implementing integrated maintenance support is only a question of revising three separate contracts into a single contract.

INPUT

III USER EXPENDITURES, PROBLEMS, AND PLANS

III   USER EXPENDITURES, PROBLEMS, AND PLANS

A.   USER SAMPLE

- The user sample interviewed is broken down into users of mainframes, as shown in Exhibit III-I, and users of minicomputers/small business systems, as shown in Exhibit III-2, in terms of the number of times vendor equipment was present at a given site.

- Most large sites use a variety of suppliers:

    - A mix of mainframes (e.g., IBM and a plug-compatible mainframe vendor such as Amdahl).

    - A mix of mainframe and small business system/minicomputer vendors.

- This resulted in a total sample of 423 mainframe responses and 234 small business system/minicomputer mentions, from 306 interviews. Overall, the samples represent fairly the strengths of the vendors shown in the two markets, (but are obviously not precise measures of market shares).

- Nevertheless, since the sample was chosen randomly within each sector, the only bias incurred was that of industry sector. INPUT's selection of a balanced number of interviews across all sectors will overemphasize vendors who are dominant in small sectors of the economy (e.g., utilities) and underemphasize vendors who are dominant in large sectors (e.g., manufacturing).

INPUT

EXHIBIT III-1

USER SAMPLE BY MAINFRAME VENDOR

MANUFACTURER	SITES WITH VENDOR MAINFRAME	PERCENT SAMPLE
IBM	226	53%
Honeywell	48	11
Burroughs	48	11
Univac	44	10
Amdahl	29	7
National Advanced Systems	12	3
Control Data	12	3
Tandem	4	1
Magnuson	4	1

Note: Multiple vendors were present at many large sites so that total number of sites is larger than number of interviews

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EXHIBIT III-2

USER SAMPLE BY

MINICOMPUTER/SMALL BUSINESS SYSTEM VENDOR

MANUFACTURER	SITES WITH VENDOR MINICOMPUTER	PERCENT SAMPLE RESPONSE
Digital Equipment Corp.	41	23
Hewlett-Packard	22	12
IBM	13	7
NCR	12	7
Four Phase	12	7
Datapoint	12	7
Wang	10	6
Data General	8	4
CDC	6	3
Prime	5	3
Perkin Elmer	4	2
Nixdorf	3	2

Others Include: General Automation, Computer Automation, Microdata, Texas Instruments, Harris, Interdata, Bunker Ramo, Triad, Paradyne, Xerox, Quantel.

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B.   EDP EXPENDITURES, 1982-1983

- The first analysis of user budgets concerns the rate at which EDP budgets are growing. This was analyzed in three ways:

    - By size of company within each category of equipment.

    - By category of equipment within the major industry sectors.

    - Between IBM users and non-IBM users.

I.   EXPENDITURES' GROWTH BY COMPANY SIZE

- The analysis by company size within equipment type offers the following indications:

    - In relative terms, the comparison of net change in expenditures between the three company size groups will indicate where the growth is.

    - In absolute terms, the multiplication of net change by average budget will show where the money will be spent in 1983.

- For example, the sample shows that medium-sized companies are the best growth area in mainframes. However, more dollars will be spent in 1983 by the large companies, even though user budgets in that area are only growing at 8%, as shown in Exhibit III-3.

- For the field service manager this means that his 1983 plan should allow for more of the types of contracts (e.g., two-shift, six-day) and service; (e.g., on-site resident engineer) that his large company customers prefer.

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EXHIBIT III-3

EDP EXPENDITURES GROWTH BY
SIZE OF COMPANY WITHIN EQUIPMENT CATEGORY

EQUIPMENT CATEGORY	COMPANY SIZE	SAMPLE SIZE (COMPANIES)	AVERAGE EDP BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
Mainframes	Small	18	190	+23%
	Medium	15	188	+39
	Large	33	1,225	+ 8
Minicomputers	Small	7	88	+ 20
	Medium	INSUFFICIENT DATA, NO ANALYSIS		
	Large	17	413	+ 24
Micro/Personal Computers	Small	4	7	+52
	Medium	6	8	+75
	Large	11	68	+57

Source: User Interviews As Indicated   **Continued**

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EXHIBIT III-3 (Cont.)

EDP EXPENDITURES GROWTH BY
SIZE OF COMPANY WITHIN EQUIPMENT CATEGORY

EQUIPMENT CATEGORY	COMPANY SIZE	SAMPLE SIZE (COMPANIES)	AVERAGE EDP BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
Terminals	Small	18	38	+39
	Medium	17	82	+17
	Large	29	737	+28
Peripherals	Small	9	213	+16
	Medium	14	482	+ 7
	Large	22	831	+16
Communications HW/SW	Small	13	166	+ 9
	Medium	14	46	+ 9
	Large	20	230	+23

Source: User Interviews As Indicated

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- However, longer-term plans should cater to a rising proportion of medium-sized company services and contracts.

- The significance of these moves will vary from vendor to vendor according to his business environment(s).

- Microcomputer/personal computer budgets are rising rapidly across all sizes of companies, even though budgets for this type of equipment are only significant in large companies as yet. Nevertheless, the size of increases planned clearly show the acceptance of the role of personal computers in business (as opposed to the home).

- Medium-sized companies are not such high-growth areas for vendors of terminals, peripherals, and data communications equipment and software, as the second page of Exhibit III-3 shows.

- In terminals markets the largest growth in 1983 will be in small companies. The dollars will be principally spent in large companies - 88% of all new dollars spent on terminals in 1983 will be from large companies.

- In peripherals markets, 1983 growth will again come from large and small companies. Two-thirds of the new dollars will be spent by large companies.

- In communications equipment and software markets, the imbalance is even more pronounced. The largest 1983 growth market is that of the large companies who will spend 74% of the new dollars.

2. EXPENDITURES BY INDUSTRY SECTOR

- Three major industry sectors were analyzed for EDP expenditures growth because of their significance to the vendor community:

    - Manufacturing (combining discrete and process manufacturing).

INPUT

- Banking and finance.

- Distribution (both retail and wholesale).

- This finer analysis shows more clearly how widely individual sector spending plans can vary from sector to sector.

- In the manufacturing sector, as shown in Exhibit III-4, mainframe budgets are expected to be almost flat in 1983, while increased spending is expected in all other equipment categories.

- The largest share of new dollar spending is planned in terminals, with one-third of all manufacturing EDP equipment spending increases going to that market. Obviously, distributed processing is favored in this sector.

- This is closely followed by minicomputers (30%) and more distantly by peripherals (19%).

- In the banking and finance sector, centralized processing is still favored, as shown in Exhibit III-5.

    - Fifty-one percent of new dollar spending in 1983. is planned for mainframes (the net change on the 1982 budget is an increase of 11%).

    - Forty percent of the new dollar spending in 1983 is planned for peripherals.

    - Fifteen percent of new dollar spending is for data communications hardware and software.

- At the same time there will be cutbacks in the budgets allocated to terminals and only small minicomputer and microcomputer outlays (even though these budgets are growing rapidly).

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EXHIBIT III-4

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EDP EXPENDITURES GROWTH IN THE
MANUFACTURING SECTOR, 1982-1983

EQUIPMENT CATEGORY	RESPONDENTS AVERAGE BUDGET ROUNDED ($ thousands)	PERCENT OF COMPANIES WITH:		NET CHANGE 1982/1983 (percent)
		INCREASE	DECREASE	
Mainframes	579	82	18	+ 2
Minicomputers	699	89	11	+25
Micro/Personal	69	88	12	+62
Terminals	476	92	8	+41
Peripherals	1,127	100	–	+10
Communications HW/SW	201	100	–	+24

Source: 62 User Responses

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EXHIBIT III-5

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EDP EXPENDITURES GROWTH IN
THE BANKING/FINANCE SECTOR, 1982-1983

EQUIPMENT CATEGORY	RESPONDENTS AVERAGE BUDGET ROUNDED ($ thousands)	PERCENT OF COMPANIES WITH:		NET CHANGE 1982/1983 (percent)
		INCREASE	DECREASE	
Mainframes	750	100	–	+11
Minicomputers	21	100	–	+39
Micro/Personal	13	100	–	+77
Terminals	177	89	11	–16
Peripherals	271	100	–	+24
Communications HW/SW	99	89	11	+24

Source: 22 User Responses

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- In the distribution sector, the breakdown of new dollar spending is again different, as shown in Exhibit III-6:

    - Thirty-five percent (the largest share) will occur in peripherals.

    - Thirty-three percent will be spent on minicomputers.

    - Twenty percent will go for mainframes.

- Terminals will have only 5% of new spending, despite high growth (46%).

- Mainframe equipment expenditures are expected to grow only 11%, but in actual spending this represents 22% of the total increase in user budgets in 1983.

3. IBM VERSUS NON-IBM EXPENDITURES

- The difference between IBM and non-IBM user expenditures identifies two significant concerns for vendors:

    - Where IBM is established in a market, its average user budgets are larger than the average of all other vendors.

    - In markets where IBM is not yet established, IBM's user expenditures are growing faster, on average, than all other vendors.

- As a result, the new dollar expenditures for IBM equipment are consistently higher than dollars available for other vendors.

- Exhibit III-7 shows the pattern, by type of equipment, for planned expenditures in 1983.

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EXHIBIT III-6

EDP EXPENDITURES GROWTH IN
DISTRIBUTION SECTOR, 1982-1983

EQUIPMENT CATEGORY	RESPONDENTS AVERAGE BUDGET ROUNDED ($ thousands)	PERCENT OF COMPANIES WITH:		NET CHANGE 1981/1982 (percent)
		INCREASE	DECREASE	
Mainframes	313	82	18	+10
Minicomputers	54	100	–	+96
Micro/Personal	Insufficient Data, No Analysis			
Terminals	16	88	12	+46
Peripherals	1,061	80	20	+ 9
Communications HW/SW	64	100	–	+20

Source: 44 User Interviews

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EXHIBIT III-7

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EDP EXPENDITURES GROWTH,
IBM VERSUS NON-IBM, BY EQUIPMENT CATEGORY

CATEGORY	SAMPLE SIZE (companies)	AVERAGE RESPONDENT BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
● IBM Mainframes	37	958	+11%
– Non-IBM Mainframes	29	383	+11
● IBM Minicomputers	16	183	+47
– Non-IBM Minicomputers	15	338	+29
● IBM Microcomputers	10	17	+99
– Non-IBM Microcomputers	11	59	+50
● IBM Terminals	30	618	+30
– Non-IBM Terminals	34	141	+22
● IBM Peripherals	24	677	+15
– Non-IBM Peripherals	21	572	+10
● IBM Communications HW/SW	24	179	+17
– Non-IBM Communications HW/SW	23	135	+21

Source: User Interviews As Indicated

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a. Mainframes

- The average IBM user mainframe budget is two and one-half times as large as the non-IBM vendor average. Therefore, even though it is a mature market, and overall growth is the same for IBM and non-IBM users, the new dollar expenditures for IBM equipment are more than twice those available for non-IBM equipment.

b. Minicomputers

- IBM, with no discernible market strategy in minicomputers, is not the market leader by a wide margin and has had only average success with its products to date.

- Nevertheless, IBM user expenditures are planned at a level far above non-IBM users so that in terms of increased dollar spending in 1983, IBM will receive almost as much as vendors who have a much stronger market share.

c. Microcomputers

- IBM is a newcomer to this market and existing user budgets are smaller than those of other vendors (nearly three and one-half times smaller). In terms of growth of these budgets, IBM users are growing nearly twice as fast as other vendors' users, drastically reducing the advantage vendors have over IBM.

d. Terminals

- This is an established IBM market, and therefore one where the average IBM user budget is far higher than other vendors' users (over 4 times larger).

- In addition the 1983 increase in spending by IBM users is larger than non-IBM users, widening the difference in spending even further.

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e.   Peripherals

- Peripherals are the overall market for 1983 with a 26% share of increased spending - the largest of any equipment category. IBM users' budgets average slightly more than non-IBM users but are growing much faster. Therefore, once again increased spending on IBM peripherals will be far higher than that on non-IBM peripherals.

f.   Data Communications (DC) Hardware And Software

- This is the only market where IBM user budgets are growing at a slower rate than non-IBM users. Nevertheless, since the average IBM user budget is larger than that of the average non-IBM user, there will be more new dollars spent on IBM DC equipment and software than on other vendors.

C.   MAINTENANCE EXPENDITURES

- Total user maintenance expenditures were analyzed for software and hardware components, along the lines of the analysis for expenditures on equipment:

  - By company size.

  - By industry sector.

  - IBM versus non-IBM users.

1.   MAINTENANCE EXPENDITURES GROWTH BY SIZE OF COMPANY

- Expenditures on software maintenance are currently one-quarter the amount spent on hardware maintenance. This does not reflect the potential of the market, and over the next five years this gap may be reduced to a two-to-one ratio of hardware versus software maintenance.

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INPUT

- The potential is huge for increased vendor revenue from systems software maintenance, from increased prices, expanded product lines, and heavier marketing of products to end users.

- Application software will remain largely the province of the end user himself and third-party vendors of packages (although specific opportunities do exist for vendors to maintain certain user packages. See section III.G.)

- Exhibit III-8 shows the expectations of users for growth of maintenance expenditures on hardware and software, by company size.

- First, the rate of growth of software maintenance expenditures is approximately twice that of expenditures on hardware maintenance.

- Second, the largest increase is planned by the larger companies; i.e., those with the largest budgets.

- Third, in terms of increased spending in 1983, the increase in hardware maintenance expenditure is only twice the increase in money spent on software maintenance - a reflection of the trend to come.

2. MAINTENANCE EXPENDITURES BY MAJOR INDUSTRY SECTOR

- As with equipment budgets, the maintenance budgets of the three main industry sectors were examined, as shown in Exhibit III-9.

- These revealed a consistent pattern of steady growth of hardware maintenance expenditures (10-11% in the main sectors, less in the other sectors, giving an overall average of 9% for the entire market).

- This suggests that users, rightly or wrongly, are not budgeting in 1983 for the 12-15% increases in maintenance pricing that vendors have become accustomed to imposing year after year.

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EXHIBIT III-8

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MAINTENANCE EXPENDITURES GROWTH BY SIZE OF COMPANY

EXPENDITURE CATEGORY	COMPANY SIZE	SAMPLE SIZE (companies)	AVERAGE BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
Software Maintenance	Small	13	21	+16%
	Medium	11	16	+14
	Large	20	51	+23
Hardware Maintenance	Small	18	68	+10
	Medium	17	76	+ 6
	Large	23	246	+10

Source: User Interviews As Indicated

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EXHIBIT III-9

HARDWARE AND SOFTWARE

MAINTENANCE BUDGET GROWTH, 1982-1983, BY INDUSTRY SECTOR

INDUSTRY SECTOR	SAMPLE SIZE (companies)	RESPONDENTS AVERAGE BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
Manufacturing	62		
Hardware		222	+10
Software		16	+25
Banking	22		
Hardware		75	+10
Software		52	+17
Distribution	44		
Hardware		86	+11
Software		20	+22
All Sectors	128		
Hardware		139	+ 9
Software		33	+21

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- Furthermore, if growth in field services revenue of 19%-20% is to be achieved, then new equipment sales will have to contribute half of that growth.

- In the manufacturing sector, user software maintenance expenditures are planned to increase by 25%, but this is over a small average budget. Hardware maintenance expenditure increases, in monetary terms, easily exceed software maintenance by more than 5:1.

- In the banking sector the picture is reversed. A substantial base of installed software has already brought the average software maintenance budget up to $52,000.

- Planned increases in 1983 represent slightly more money than the increases planned for hardware maintenance. By 1983 the total budget spent on software maintenance will be over half that spent on hardware maintenance.

- In the distribution sector software maintenance once again is growing twice as fast as hardware maintenance. However, the average budget for software maintenance is far smaller than that for hardware maintenance.

- Overall, today's user expenditures on hardware still outweigh expenditures on software by 4:1. (However, in terms of increases in spending, the ratio is only 2:1.)

3. MAINTENANCE EXPENDITURES ON IBM PRODUCTS VERSUS NON-IBM PRODUCTS

- All the data presented on plans for maintenance expenditures represent the net charge on the sample of users analyzed.

- This includes drastic cutbacks forced upon users by the business downturn, negating some substantial increases in other businesses.

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- In addition, the sample only deals with existing users of record in June 1982. It does not include new accounts that will be added to the base by 1983 (who presumably will be in a financial condition adequate for expansion or purchase of computer facilities).

- Therefore the "net charge" percentages given are probably understatements. Nevertheless, it appears that the poor economy is having its effect on maintenance revenue growth.

- Exhibit III-10 provides the average budget and growth rate of approximately 60 user companies who provided hardware and software maintenance expenditures data.

- Planned increases for 1983 over 1982 budget levels average 7%-9%, net of any decreases. These numbers were affected by some significant cutbacks planned by a number of users for 1983.

- Incremental revenue in 1983 for IBM hardware maintenance averages out at twice the amount planned for non-IBM hardware maintenance.

- In software maintenance the IBM advantage is minor.

- The IBM advantage in maintenance therefore stems only from the fact that on average IBM customers have larger EDP budgets that non-IBM users. This is a direct result of IBM's superb marketing and sales force that has consistently outperformed other vendors.

D.   USER EVALUATION OF FIELD SERVICE

- A number of issues were examined in relation to users' evaluation of field service including:

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EXHIBIT III-10

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MAINTENANCE EXPENDITURES,

IBM VERSUS NON-IBM, SOFTWARE AND HARDWARE

CATEGORY	SAMPLE SIZE (companies)	AVERAGE RESPONDENT BUDGET ($ thousands)	NET CHANGE 1982/1983 (percent)
● IBM Hardware	28	201	+ 7
– Non-IBM Hardware	30	80	+ 9
● IBM Software	21	46	+16
– Non-IBM Software	23	45	+15

Source: User Interviews As Indicated

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- User rating of vendors' field service.

- User environment in which equipment is installed.

- Type of contracts in use, by industry sector.

- Relative importance users accord to service cost, uptime, response time, and vendor reputation.

- The influence of field service personnel on user decisions for purchasing new equipment, software, and supplies.

1. USER RATING OF VENDOR MAINTENANCE

- The 1982 user rating of mainframe vendors, minicomputer vendors, and small business system vendors is provided in Exhibits III-11 and III-12, wherever sufficient data were available.

- The exhibits are based on users' subjective evaluations of vendor service; users were not asked to substantiate their opinions.

a. Mainframes

- Amdahl outperformed all other vendors in user ratings of vendor maintenance, in this year's study. Not a single user interviewed complained of poor service and nearly 90% rated field service as high quality.

- Honeywell was the second highest-rated field service supplier this year, with over 80% of their users giving a high rating.

- IBM, on the largest user sample, was highly rated, but 24% of users felt they were receiving only average maintenance service - a high enough percentage to be of concern to IBM.

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EXHIBIT III-11

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USER RATING OF VENDOR MAINTENANCE, MAINFRAMES

VENDOR	RESPONSES	RATING (percent)		
		HIGH	MEDIUM	LOW
1. Amdahl	9	89	11	0
2. Honeywell	11	82	18	0
3. IBM	67	74	24	2
4. Univac	17	59	41	0
5. Burroughs	24	46	50	4

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EXHIBIT III-12

USER RATING OF VENDOR MAINTENANCE,
MINICOMPUTERS/SMALL BUSINESS SYSTEMS

VENDOR	RESPONSES	RATING (percent)		
		HIGH	MEDIUM	LOW
● DEC	16	68	32	0
● IBM	13	62	38	0
● Four Phase	8	50	25	25
● Hewlett Packard	6	17	83	0
● NCR	4	25	50	25
● Wang	3	33	67	0
● Datapoint	3	33	67	0
Insufficient Data For Other Vendors				

- Nearly 60% of Univac users found maintenance service to be of high quality, but the remainder believe they are only receiving average support.

- The dominant rating of Burroughs, NAS, and Tandem field service was medium, with NAS frequently rated low.

    b.   Minicomputer/Small Business Systems

- The response level on vendor rating for minicomputers and small systems was not very high (60 companies). When divided into individual vendor ratings, the sample is rapidly diminished for some vendors.

- Nevertheless the ratings do indicate how successful vendor field services are in their customers' eyes.

- Overall, no vendors have been able to convince their users that the service provided is uniformly of a high quality. The predominant rating is medium.

- Only DEC, IBM, and Four Phase Systems had a majority of high user rankings. All other vendors received mainly medium ranking.

2.   ENVIRONMENT IN WHICH EQUIPMENT IS USED

- The acceptability of the environment in which equipment is to be installed and used is of rising concern to field service managers, as shown in Exhibit IV-30 in the Vendor Analysis section.

- Equipment distribution by equipment category is analayzed in Exhibit IV-27, clearly showing the varied requirements.

- User data were studied to classify the environment in which equipment is installed by industry sector.

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- This information is useful in establishing new product service plans. Many marketing plans target specific industry sectors, and knowing the environment mix which goes with each sector can help specify equipment reliability, availability, and serviceability requirements.

- Exhibit III-13 provides a summary of the findings.

    - General office environment is most often used in banking, services and manufacturing sectors.

    - Plant/factory environment is used only in distribution, manufacturing, and utilities sectors.

    - Special environments are found only in federal government, medical, education, and services.

3.   TYPE OF SERVICE CONTRACT USED

- The type of contract in use was analyzed by sector for the same purpose as D.2: to establish a relationship between areas of activity and type of contract preferred.

- Interesting relations can be drawn, as shown in Exhibit III-14.

    - Repair depot style maintenance is found in sectors where the business concept and use of depots are already accepted: the wholesale sector and manufacturing.

    - Time and materials contracts are very popular in these same sectors, and to a lesser degree in insurance and retail sectors.

    - "Other" refers to on-site resident engineers and special contracts found in a number of sectors, particularly federal government and utility.

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EXHIBIT III-13

ENVIRONMENT IN WHICH EQUIPMENT IS USED, BY INDUSTRY SECTOR

SECTOR	LOCATION (percent)			
	COMPUTER ROOM	GENERAL OFFICE	PLANT/ FACTORY	OTHER
Discrete Manufacturing	83%	11%	6%	0%
Process Manufacturing	86	10	4	0
Transportation	96	4	0	0
Utilities	92	6	2	0
Banking and Finance	87	13	0	0
Insurance	93	7	0	0
Medical	90	6	0	4
Education	93	5	0	2
Retail	81	17	2	0
Wholesale	89	8	3	–
Federal Government	85	4	1	10
State and Local Government	92	8	0	0
Services	88	11	0	1
All Sectors	89%	8%	2%	1%

Sample Size: 276 Users

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EXHIBIT III-14

MAINTENANCE CONTRACT TYPE USED,
BY INDUSTRY SECTOR

SECTOR	TYPE OF CONTRACT IN USE			
	STANDARD CONTRACT	T&M	REPAIR DEPOT	OTHER
Discrete Manufacturing	100%	19%	2%	0
Process Manufacturing	96	25	7	4%
Transportation	100	0	0	0
Utility	88	0	0	12
Banking and Finance	100	0	0	0
Insurance	100	8	0	4
Medical	95	0	0	5
Education	93	0	0	7
Retail	95	5	0	0
Wholesale	100	14	5	0
Federal Government	89	0	0	11
State and Local Government	100	0	0	0
Services	97	0	0	3
All Sectors	96%	6%	1%	4%

Sample Size: 234 Users

Note: Users were given multiple options, so that percents do not cross total to 100.

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- Outside these sectors, standard contracts are the common practice of users. (In many cases this is more a result of following common practice than of careful consideration of alternatives. Otherwise time and materials contracts might be far more prevalent.)

4. RELATIVE IMPORTANCE OF COST, UPTIME, RESPONSE TIME, AND VENDOR REPUTATION

- In choosing equipment, field service is a major concern of users who habitually want to know:

    - Where the nearest field service center is located.

    - How many engineers staff the center in relation to the number of customers that one supported by that center.

    - What customers provide references on support received.

- The relative importance of the major user concerns that go under the field service heading had not been established to date, however.

- INPUT analyzed four factors in the 1982 study both for hardware and software maintenance. The results are given in Exhibit III-15.

- Significantly, the least important aspect of all of the main field service components is price. (This does not mean that price is of no concern - users uniformly rated it at 3.4 on a scale of 1 to 5.)

- The most important aspect, for both hardware and software maintenance is system uptime. Reliability of the system, hardware and software, is the overriding factor in the users' thinking on maintenance (and commands a premium on the actual sales price of the equipment in many cases, as vendors are aware).

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EXHIBIT III-15

USER EVALUATION OF THE IMPORTANCE OF
COST, UPTIME, RESPONSE TIME, AND VENDOR REPUTATION

FACTOR	HARDWARE MAINTENANCE	SOFTWARE MAINTENANCE
Cost	3.4	3.4
System Uptime	4.8	4.7
Response Time	4.6	4.3
Vendor Reputation	3.7	3.7

Main
←―User
Concern

Rating: 1 = Low, 5 = High

Note: The data were analyzed by industry sector but
only minor variances were found from the averages
given above.

- Response time - which is directly related to how fast a failed system can be brought on-line again - is the second most important issue.

- There were no outstanding differences between users' ratings of these field service components on hardware and software. Users obviously reason in terms of total system performance, not in terms of the performance of individual components.

5.   INFLUENCE OF FIELD SERVICE PERSONNEL ON USER PURCHASING DECISIONS

- Field service personnel, through preventive maintenance, system failures, system upgrades, and the installation of FCOs have the most frequent contact with the customer of any vendor personnel. This includes salesmen.

- Not surprisingly this frequency of contact, allied with the engineer's intimate knowledge of the equipment he maintains at the user's site makes him, in the user's eyes, an EDP specialist akin to an independent consultant.

- As a result, what he says carries weight. This has not been lost on a number of vendors who encourage their engineers to make suggestions to their users on products ranging from new systems to supplies and software.

- Exhibit III-16 details the proportion of users who receive suggestions from their FE and how many act on the suggestions that are made.

- Of the approximately 40% of users who receive suggestions, two-thirds act on them, on every aspect of their EDP purchases.

- This suggests vendor field service personnel are not doing enough of this. If two-thirds of the users who receive suggestions act on them, why isn't every user actively encouraged to make purchases instead of only 40%?

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EXHIBIT III-16

INFLUENCE OF FIELD SERVICE PERSONNEL ON
USER PURCHASING DECISIONS

PRODUCT	PERCENT OF RESPONDENTS	
	RECEIVE SUGGESTIONS	ACT ON THEM
New Systems	40	27
Peripherals/Add-Ons	41	26
Communications Products	40	28
Software	41	28
Supplies	39	27

Sample: 244 Users

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- There is a definite opportunity here for action by field service managers in conjunction with marketing and sales.

E.   THIRD-PARTY MAINTENANCE (TPM)

- TPM is rapidly becoming a small industry in its own right. Initially a fringe activity of very specialized, small companies, TPM is now becoming a major force in field services.

- The market, worth approximately $460 million in 1981 or slightly less than 6% of the total field service revenue, is growing at 18%.

- Over 200 companies share this revenue, very unevenly. Fewer than one-quarter of these have been active for more than 10 years.

- TRW customer services is the largest with a nationwide support network and 2,200 field service personnel. Revenue is approximately $120 million - the equivalent of half of the sales of a good-sized minicomputer vendor such as Four Phase systems.

- Third-party maintenance has come of age and a number of large corporations are beginning to address the market in several different ways. The principal areas of activity depend on either:

  - Equipment category: TPM specialists; e.g., for microcomputers, minicomputers, terminals, peripherals, large mainframes, or optical scanners.

  - Equipment vendor: e.g., IBM, DEC, Calcomp, Data General, or CDC.

  - Geographic coverage: local, state, regional, national.

  - Parts repair: printed circuit boards (PCBs), memories, disk heads etc.

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1.   USER AND EQUIPMENT VENDOR ACCEPTANCE OF TPM

- The viability of the TPM concept has been proven beyond a doubt in two markets:

    - Competitive third-party maintenance, where the TPM is in direct competition with the vendor of the equipment and possibly other TPM suppliers.

    - Noncompetitive third-party maintenance, where the TPM obtains a multiyear agreement from the equipment vendor to service the equipment.

- User acceptance of both forms of TPM (i.e. both when it is endorsed by the equipment vendor and when it is opposed) has been good. Generally, users are willing to at least consider TPM, and the principal obstacle to this is knowing the third-party service vendor exists.

- Noncompetitive TPM is naturally preferred by TPM vendors, and equipment vendor utilization of TPM (as a way of extending service coverage at little investment) has become widespread with terminal, peripheral, and microcomputer vendors.

2.   USER EXPERIENCE OF TPM

- User experience of TPM, to date, is slight, as the size of the third-party maintenance market shows - only 6% of total field service revenue.

- User experience, such as it is, varies significantly by equipment category and to a certain extent by industry sector.

- Exhibit III-17 summarizes the findings of the study, over a sample of 103 users.

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EXHIBIT III-17

USERS' EXPERIENCE WITH THIRD-PARTY MAINTENANCE VENDORS, BY INDUSTRY SECTOR

SECTOR	CPUS	PERIPHERALS	TERMINALS	DC EQUIPMENT	OFFICE EQUIPMENT	SOFTWARE
Discrete Manufacturing	1.5	1.8	1.6	1.3	1.3	1.5
Process Manufacturing	2.5	2.5	1.9	1.6	1.0	1.6
Transportation	1.6	1.6	1.4	1.4	1.6	2.0
Utilities	2.2	1.8	2.4	2.5	2.3	1.0
Banking and Finance	1.6	1.5	1.7	1.3	1.3	1.5
Insurance	1.7	1.9	2.3	1.5	2.0	1.6
Medical	1.8	2.9	1.5	1.3	1.0	1.7
Education	1.0	2.8	2.0	1.0	3.0	1.0
Retail	2.2	2.5	3.0	2.8	1.0	2.8
Wholesale	1.6	1.9	2.2	1.8	1.7	1.3
Federal Government	3.3	4.3	5.0	3.0	5.0	4.5
State and Local Government	2.8	3.4	3.5	3.5	3.0	3.0
Services and Other	2.0	2.4	2.9	1.6	1.0	1.8
Average, All Sectors	2.0	2.4	2.4	1.9	2.1	1.9

Rating: 1 = Low, 5 = High

Sample: 103 Users

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INPUT
FA82

- Utilities, retail, state and local government, and federal government are the best markets, particularly federal government.

- Data communications equipment, office equipment, and software have remained relatively untouched.

- The best TPM markets so far are the peripherals and terminals markets. These will be rapidly superseded by the microcomputer market where high volume, rapid geographic expansion, and low equipment cost have so far led the equipment manufacturer to concentrate on production, rather than service or support.

3. USER SATISFACTION WITH TPM

- For users who have experienced third-party maintenance, the satisfaction levels vary by industry sector, as shown in Exhibit III-18.

- Again state and local government and federal government show the highest across-the-board satisfaction levels (in conjunction with the highest experience levels). Excluding office equipment and software, process manufacturing exhibits reasonable satisfaction with TPM also.

- Peripherals and terminals markets, where the experience is greatest, demonstrate good levels of satisfaction across all industry sectors. Ratings above 3.0 are not unusual.

- Some areas of success have been found in office equipment and software:

    - Education and government (all) show above average satisfaction with TPM in office equipment.

    - Medical, education, and federal government show high levels of satisfaction with TPM in software (principally software houses maintaining system and application software that they sell in these markets).

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EXHIBIT III-18

USERS' SATISFACTION WITH THIRD-PARTY MAINTENANCE VENDORS, BY INDUSTRY SECTOR

SECTOR	CPUS	PERIPHERALS	TERMINALS	DC EQUIPMENT	OFFICE EQUIPMENT	SOFTWARE
Discrete Manufacturing	2.1	2.5	2.2	1.9	2.1	1.7
Process Manufacturing	2.5	3.0	3.3	3.0	2.0	1.7
Transportation	2.5	2.3	2.0	1.8	2.0	2.3
Utilities	2.0	1.8	2.4	2.5	2.5	1.0
Banking and Finance	1.9	2.2	2.4	2.6	2.1	1.5
Insurance	2.8	2.6	3.2	1.5	1.9	2.6
Medical	2.0	3.0	2.0	1.0	1.0	5.0
Education	ND	3.0	2.0	ND	5.0	5.0
Retail	2.3	2.3	2.8	2.3	1.0	2.5
Wholesale	2.6	3.2	2.7	2.3	2.7	2.5
Federal Government	3.3	4.0	4.0	4.3	5.0	4.5
State and Local Government	3.8	3.8	3.7	2.0	3.0	2.0
Services and Other	2.9	3.3	2.4	2.0	2.3	1.8
Average, All Sectors	2.6	2.8	2.7	2.3	2.5	2.6

Rating: 1 = Low, 5 = High   ND = No data

Sample: 64 Users

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- Overall, it appears that the more experience users have of third-party maintenance, the better they like it - an encouraging finding for third-party maintenance vendors.

4. LIKELIHOOD OF INCREASED TPM USAGE

- Less encouraging was the answer to the question of likelihood of TPM use. Users do not plan to extend TPM usage beyond the current levels, except in certain well-defined markets, as shown in Exhibit III-19.

- Federal, state, and local government are strongly in favor of third-party maintenance in CPU, peripheral, terminal, and office equipment markets.

- Education sector users also plan increased TPM use in office equipment and software.

- For medical sector users, peripherals and software are the two areas where increased TPM use is planned.

- TPM suppliers supporting terminals should find that insurance, process manufacturing, and retail sectors are increasing their acceptance of TPM.

- TPM is obviously not yet accepted by the majority of users; it has a reputation and an image to establish before it will become a common alternative to maintenance from the equipment vendor.

5. NEW TPM MARKET ENTRANTS

- A number of major equipment vendors are considering entering the TPM market, as a way of:

    - Securing their customer sites from unwarranted intrusions.

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EXHIBIT III-19

LIKELIHOOD OF INCREASED USAGE OF THIRD-PARTY MAINTENANCE VENDORS, BY INDUSTRY SECTOR

SECTOR	CPUS	PERIPHERALS	TERMINALS	DC EQUIPMENT	OFFICE EQUIPMENT	SOFTWARE
Discrete Manufacturing	1.3	1.7	1.6	1.3	1.7	1.1
Process Manufacturing	2.3	2.3	2.4	2.5	1.8	2.1
Transportation	2.2	2.2	2.0	1.8	2.6	2.6
Utilities	2.2	1.8	2.4	2.0	2.0	1.0
Banking and Finance	1.3	1.4	1.6	1.6	1.6	1.6
Insurance	1.7	1.8	2.9	1.6	2.5	2.3
Medical	1.0	2.6	2.2	2.0	2.0	3.3
Education	1.0	1.7	1.5	1.0	5.0	1.0
Retail	2.3	1.0	3.0	3.0	1.0	2.5
Wholesale	2.0	1.9	2.3	1.6	2.3	2.3
Federal Government	1.0	2.3	2.0	2.3	1.0	1.5
State and Local Government	2.0	2.0	3.0	2.5	3.5	2.5
Services and Other	1.9	2.4	1.4	1.4	1.5	1.4
Average, All Sectors	1.7	1.9	2.2	1.9	2.2	1.9

Rating: 1 = Low, 5 = High
Sample: 91 Users

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- Broadening the product base from which their maintenance network receives revenue.

- Penetrating other vendors' markets and gaining a foothold.

- Amdahl is expected to announce shortly that it will offer a facilities management maintenance service. Amdahl service engineers will maintain the peripherals and terminals attached to the Amdahl mainframe. This increases Amdahl's appeal to its end users, since it simplifies the customer's service contracts and enables him to place total system service responsibility on one company, for all hardware and software.

- This kind of move can work both ways. Magnuson has signed a contract with Memorex (UK) Ltd. for Memorex to service Magnuson CPUs (not only those that have Memorex peripherals attached). This is an excellent deal for both parties.

- Olivetti Corporation has announced its entry into the TPM market to expand the product base which produces service revenue. There are 500 field service personnel with insufficient revenue per head at present.

- Two further aspects broaden the understanding of such a move:

    - Olivetti president believes that to have a strong position in the office products/small system market, a company needs a broad range of products that can be integrated into a complete system - a single source of service can begin this integration process.

    - Olivetti Corporation has been a loss-maker for a long time; the profit contribution of a broader service base can be significant. Olivetti's merger with Docutel gives it a service base that Docutel has leased until now from TRW Customer Services.

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- RCA Service Company announced a 27% sales increase in TPM in 1981 -and then announced:

    - That Onyx eight- and 16-bit microprocessors will be serviced by RCA.

    - That RCA will provide TPM for Apple Computer's OEM distributors from service centers in 28 U.S. cities.

- The Apple service will be provided with no zone adders anywhere in the United States. After hours service is also available.

- RCA is setting up a special diagnostic center in New Jersey, to be in place by September 1, which will be similar to Apple's support center in Cupertino, California. The center will support both RCA field engineers and Apple OEMs.

F. INFLUENCE OF FIELD SERVICE ON PERSONAL COMPUTER PURCHASE PLANS

- The field service aspect of personal computers has a significant impact on purchasing plans of both the EDP department and the end user.

- The personal computer is the first product where the individual user's opinion has played such a determining role in the purchase decision (hitherto the exclusive domain of the EDP department).

- Exhibit III-20 shows how important field service considerations are to this decision.

- Clearly the principal determinant is the intrinsic system reliability of the equipment purchased. However, service availability is almost as important to all sectors of industry.

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EXHIBIT III-20

INFLUENCE OF FIELD SERVICE ON EDP DEPARTMENT AND
USER PERSONAL COMPUTER PURCHASING PLANS, BY INDUSTRY SECTOR

SECTOR	MAINTENANCE COST		SERVICE AVAILABILITY		HARDWARE RELIABILITY	
	EDP	USER	EDP	USER	EDP	USER
Discrete Manufacturing	3.4	2.9	4.3	3.6	4.3	4.0
Process Manufacturing	3.2	3.4	4.0	3.8	4.5	4.2
Transportation	3.4	3.0	3.7	3.4	4.3	4.0
Utility	3.1	3.0	4.7	4.5	4.8	4.7
Banking and Finance	3.1	2.9	4.2	4.2	4.4	4.4
Insurance	3.1	3.5	4.1	4.2	4.3	4.5
Medical	3.0	3.2	4.0	3.5	4.2	4.0
Education	3.8	2.7	4.6	4.0	4.2	4.0
Retail	3.4	3.1	4.5	4.2	4.7	4.3
Wholesale	2.8	2.2	3.5	3.3	4.6	4.3
Federal Government	3.0	3.6	4.2	4.7	4.3	4.9
State and Local Government	3.0	2.8	4.5	4.0	4.5	4.8
Services	3.2	3.2	4.2	4.1	4.6	4.5

Rating: 1 = Low, 5 = High

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- Maintenance cost, high on the check list of both EDP department and end user, rates consistently above average (2.5).

- The users' inexperience in such matters is manifested by the difference in ratings between EDP department and end user: the user often rates critical issues such as service availability lower than the more experienced EDP manager does.

G.   EDP MANAGERS' REQUIREMENTS AND PROBLEMS

- To develop an understanding of the EDP manager and his problems, inter-viewers asked each one to state his top three problems and how he planned to resolve them.

- These problems do not center around maintenance, but they establish the environment of the EDP manager. As the central figure with whom field service deals, this individual (and the pressures on him) must be understood.

- There are three types of problems that face the EDP manager:

  - User-related (i.e., those users whom the EDP department serves).

  - Personnel-related (i.e., EDP department).

  - Planning-related (i.e., internal planning).

1.   USER-RELATED PROBLEMS

- The EDP manager is frequently an isolated individual mediating between user demand for faster response, more applications, and specific requirements, on the one hand, and management's lack of understanding of EDP on the other hand.

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- In addition, the EDP manager frequently reports to the vice president of finance and administration or equivalent function, who does not have the technical grasp of EDP required to comprehend the company's needs, as expressed by the EDP manager.

- Many EDP managers have to justify their decisions twice: to the body of users they supply service to, and to their own management, as shown in Exhibit III-21.

- Prioritizing user demands, satisfying specific users, trying to respond to poorly specified requirements, and providing clear documentation on completed applications are common tasks. They are complicated by major EDP changes such as converting to a data base structure, implementing distributed data processing, or adding communications capabilities.

2. PERSONNEL-RELATED PROBLEMS

- Add to this the constant need to improve EDP staff skills, retain qualified staff, increase productivity and reduce the applications backlog, and it is clear that an EDP manager's task is not an easy one.

- Application development aids and software packages are being more frequently considered as the backlog of unmet user needs increases.

- The pressure is on the EDP manager to convince management of the real need to maintain competitive salary levels, at a time when all salaries are being held down, as shown in Exhibit III-22.

3. PLANNING-RELATED PROBLEMS

- There is an urgent need to improve the quality and precision of EDP planning to provide a stable framework for the many changes that are taking place in the EDP room.

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EXHIBIT III-21

USER REQUIREMENTS AND
PROBLEMS, MANAGEMENT/USER-RELATED

PROBLEM AS STATED	ACTION PLANNED
• "Developing our credibility with users." (common)	• "Develop simple systems quickly and successfully."
• "(Poor) top management view of EDP." (common)	• "Continue to educate users on role of EDP."
• "Top management technical awareness."	• "Education through seminar and meetings."
• "Meeting user data needs."	• "Converting to data base-driven structure."
• "User understanding of EDP."	• "Form user committees by type of usage."
• "Lack of management understanding"	• "Have individual and group sessions with management."
• "Satisfying specific users."	• "Group problems into 'demand' areas."
• "Poor user relations."	• "Increase user participation in systems design."
• "Reporting to the Controller."	• "I'm afraid there is nothing I can do."
• "Producing good documentation." (common)	• "Use the PRIDE methodology." "Improve definition of standards."
• "Prioritizing systems requirements."	• "Establish a steering committee."
• "Well-defined project specifications."	• "Demand clear system specifications from users."
• "DP department not high enough in the organization."	• "Very little can be done."
• Field office support."	• "Project underway involving communications."

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EXHIBIT III-22

USER REQUIREMENTS AND PROBLEMS, PERSONNEL-RELATED

PROBLEM AS STATED	ACTION PLANNED
• "Employee skill levels."	• "Complete training program."
• "Application development backlog." (common)	• "Add two more analysts and programmers." "LRP for the company."
• "Inadequate systems software."	• "Evaluate software packages available."
• "Getting and retaining skilled help."	• "Will have to increase salary range."
• "Backlog outpacing productivity."	• "Planning and selling (internally) the necessary hardware/software upgrades."
• "Constant threat of losing qualified staff."	• "Improve work environment."
• "Programmer productivity." (common)	• "Evaluate software development tools." "Use programming aids." "Use Marx IV."
• "Personnel retention"	• "Use outside consultants."
• "Recruiting systems staff." (common)	• "We must increase salaries."
• "Maintaining competitive salaries."	• "Plead case to upper management."
• "Provide a challenge to our maintenance group."	• "Integrate them in the information center."
• "Project control."	• "Automate a project management system."
• "Employee Motivation."	• "Give praise where it's needed(!)"
• "Expand DP knowledge of staff."	• "Increased emphasis on education."
• "Off-load work to user departments."	• "Acquire user-friendly packages."

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- FEs can play a role here, since maintenance requirements are essential to the planning process.

- The EDP manager will view this as constructive assistance. At the same time valuable insights into the EDP manager's spending plans will be gained that can be fed into vendor sales planning.

- Exhibit III-23 lists the most frequent EDP managers' planning problems.

H.   SOFTWARE MAINTENANCE

- The maintenance of the existing library of software is a growing restriction on the EDP manager's total resources. These maintenance functions include:

    - Error correction.

    - Minor application adjustments not involving redesign.

    - File structure adjustments.

    - Recompilation and test.

    - General housekeeping.

    - Documentation correction and classification.

- Most system software is purchased from the equipment manufacturer, with the exception of some data base management systems, telecommunications monitors and high level languages. Maintenance for these is always provided by the original vendor, not the user.

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EXHIBIT III-23

USER REQUIREMENTS AND PROBLEMS, PLANNING-RELATED

PROBLEM AS STATED	ACTION PLANNED
• "Budget cuts due to (poor) economy." (common)	• "Explain long term effects to management." "Prioritize use of resources."
• "Develop EDP strategic plan."	• "We need outside consultant help as well as internal users/management."
• "Long-range equipment budget needed."	• "Improve definition of user needs."
• "Improve capacity planning."	• "Develop formal plan."
• "Lack of LRP."	• "Improve management's understanding of the role of DP department."
• "Changing corporate objectives."	• "Establish a flexible DP strategy."
• "Lack of company planning."	• "None, so far."
• "Central versus distributed EDP."	• "Using outside consultants."
• "Corporate direction for MIS."	• "Produce a formal document."
• "Service remote offices." (common)	• "Implement distributed processing."
• "Provide on-line processing capacity."	• "Try to plan/keep pace with demand."
• "Office automation."	• "Produce a corporate study."
• Integrate office automation."	• "Work via a corporate committee."

- The bulk of applications software is developed and maintained by the EDP departments and/or their users.

- Software houses provide packaged applications for some of those requirements, which can be maintained by either the software house or the user (according to the software house's policy).

- Exhibit III-24 summarizes the amount of maintenance carried out on purchased software (system and application). There are significant differences from one industry sector to another.

- The distribution sector user maintains very little of the software he purchases. Four percent of the wholesale users interviewed do no maintenance on any of their purchased software.

- On the other end of the scale, 81% of the medical sector users maintain most or all of the software purchased for their systems. Similarly, many of the banking and finance sector users and education sector users do most or all of the maintenance of their purchased software.

- Many of the systems purchased by these users are the framework for internal development of the final application, creating nonstandard versions of the purchased software.

- What are the opportunities for field service organizations?

    - Where applications are maintained by the end user, their specification has been "frozen" (i.e., is not under constant revision) and where application software is tightly integrated with vendor systems software, the vendor field service organization can sell the concept of integrated maintenance.

    - Ideally this would be in instances where a single application represents the main processing vehicle for the user (e.g., airline reservation

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EXHIBIT III-24

AMOUNT OF PURCHASED SOFTWARE MAINTAINED BY USER

SECTOR	PERCENT OF PURCHASED SOFTWARE MAINTAINED				SAMPLE SIZE (companies)
	NONE	SOME	MOST	ALL	
Discrete Manufacturing	20%	43%	26%	11%	35
Process Manufacturing	41	26	12	21	34
Transportation	39	22	17	22	18
Utilities	44	28	17	11	18
Banking and Finance	19	33	33	15	21
Insurance	23	31	31	15	26
Medical	14	5	38	43	21
Education	19	25	25	31	16
Retail	50	20	20	10	20
Wholesale	64	12	12	12	24
Federal Government	22	45	33	0	9
State and Local Government	44	32	12	12	16
Services and Other	36	28	4	32	25
Average, All Sectors	33%	27%	22%	28%	

systems). Total systems responsibility can then be transferred to the vendor, who captures all the maintenance revenue of the system.

- Targets for such an approach would be those sectors where EDP is viewed only as a tool (e.g., education/academic organizations, medical sector, wholesale/retail, utilities) and not those where entrenched specialist groups will defend their responsibilities (e.g., banking/finance, federal government).

- The amount of software maintained by users is truly staggering. Exhibit III-25 provides a summary of user responses to this question.

- In most cases EDP managers were estimating/guessing at the number of lines of code per program, but most of them had a good idea of the number of programs maintained. The sample was biased by the fact that the companies responding were large, so that the results do not represent the industry as a whole.

- The opportunities for integrated maintenance must be huge. Limiting the target to application software maintained by the central EDP organization does not significantly alter the picture, since overall 73% of the applications workload is maintained this way, as shown in Exhibit III-26.

- The quality of the maintenance performed in this way must be dropping:

  - The volume of software maintained by users is rising constantly.

  - The number of new applications in the backlog is also rising.

  - The percentage of user programmers and analysts assigned to software maintenance is dropping for most sectors, as shown in Exhibit III-27.

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EXHIBIT III-25

VOLUME OF SOFTWARE MAINTAINED BY LARGE COMPANIES, BY INDUSTRY SECTOR

SECTOR	AVERAGE NUMBER OF PROGRAMS MAINTAINED	AVERAGE NUMBER OF LINES OF CODE PER PROGRAM	SAMPLE SIZE (companies)
Discrete Manufacturing	1,466	1,200	32
Process Manufacturing	1,936	2,024	26
Transportation	1,193	760	17
Utilities	1,821	598	13
Banking	890	963	22
Insurance	1,847	1,120	19
Medical	1,465	845	21
Education	1,675	577	10
Retail	1,223	725	20
Wholesale	1,162	3,080	20
Government (all)	2,228	1,185	25

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EXHIBIT III-26

APPLICATION SOFTWARE MAINTAINED BY
CENTRAL EDP ORGANIZATION

SECTOR	PERCENT OF APPLICATION SOFTWARE MAINTAINED				SAMPLE SIZE (companies)
	NONE	SOME	MOST	ALL	
Discrete Manufacturing	11%	0	27%	62%	37
Process Manufacturing	9	3%	21	67	33
Transportation	0	0	17	83	18
Utilities	0	12	29	59	17
Banking and Finance	10	20	20	50	20
Insurance	0	4	30	66	27
Medical	0	0	27	73	22
Education	12	12	6	70	17
Retail	0	9	18	73	22
Wholesale	0	0	22	78	23
Federal Government	0	0	0	100	9
State and Local Government	0	0	19	81	16
Services and Other	0	19	4	77	26
Average, All Sectors	3%	6%	18%	73%	

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EXHIBIT III-27

PERCENT OF USER PROGRAMMERS AND ANALYSTS
ASSIGNED TO SOFTWARE MAINTENANCE

SECTOR	SAMPLE SIZE	1981 (percent)	1982 (percent)	1983 (percent)
Discrete Manufacturing	35	35%	33%	31%
Process Manufacturing	29	56	49	47
Transportation	17	42	38	36
Utility	14	47	45	48
Banking and Finance	15	54	51	48
Insurance	21	49	43	43
Medical	19	42	41	44
Education	11	53	55	53
Retail	18	46	42	39
Wholesale	18	39	40	42
Federal Government	5	45	39	39
State and Local Government	15	47	44	47
Services	24	37	36	32
Average, All Sectors		46%	43%	42%

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- Therefore it seems that as time goes by the EDP manager's problem of how to maintain applications will increase, providing vendors with selective opportunities.

- Striking differences in software maintenance requirements exist in different market segments. Understanding these different requirements and designing service products to address the needs of given market segments is the key to success for service managers in the 1980s.

INPUT

IV VENDOR ANALYSIS

IV   VENDOR ANALYSIS

A.   ANALYSIS OF VENDOR FINANCIAL PERFORMANCE

I.   REVENUE, BUDGETS, AND PROFITS, 1982-1983

- 1982 was a successful year for field service managers, despite slowing equipment sales and the continued implementation of new service techniques and products.

- The average field service manager now handles a budget in excess of $30M and expects to increase this by nearly 30% in 1983. Revenue increases are expected to exceed cost increases easily so that gross margins will steadily improve.

- Averages such as those shown in Exhibit IV-I are useful for overall evaluations of vendor performance, but the individual company performances vary considerably.

- Field service, as an industry, is still accommodating a steady flow of new (small) suppliers which accounts for most of the growth in numbers of FEs. The greater part of the revenue and profit growth comes from the large established vendors.

INPUT

EXHIBIT IV-1

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SUMMARY OF RESPONDENT VENDOR FINANCIALS

COMPONENT	1982	1983	CHANGE (percent)
Total Sample Revenue ($ thousands)	$1,545,999	$1,782,689	+15.3%
- Average Field Service Revenue ($ thousands)	$42,900	$59,400	+38.5
- Average Field Service Budget ($ thousands)	$30,600	$39,000	+27.5
- Average Field Service Gross Margin (percent)	28.7%	34.3%	+5.6
- Average Field Service Profit Before Tax (percent)	19.6%	22.3%	+2.7

Total Sample: 36 Vendors

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- Gross margins averaged 28.7% of revenue in 1982 and are expected to improve more than five percentage points in 1983 to 34.3%.

- Profit before tax, nearly 20% in 1982, is also expected to improve in 1983.

2. REVENUE AND FULLY BURDENED COSTS, 1981-1987

- A more accurate picture of revenue generation can be gained from Exhibit IV-2. In 1982 revenue per FE grew 7.5% according to vendors, while costs were almost constant. As a result the gross margin per FE grew nearly 45%.

- Margins are expected to improve even faster in 1983 (by 52% over 1982) before settling down to a steady but strong 25% per annum to 1987.

- Monthly revenue per engineer will exceed $11,000 in 1986 and in the same year each engineer will, on average, contribute $3,500 of gross margin to company operations.

- Overhead will continue to decline and the proportion of FEs to total field service personnel, already 75% in 1981, is expected to increase to 78% by 1984 and 79% by 1987.

- This suggests that within five years, each FE will contribute more gross margin to his company than the sale of a good-sized minicomputer/small business system. It is likely that field services will become the main contributor to company gross margin, well before 1987.

3. FIELD SERVICE REVENUE SOURCES

- An analysis of the activities that contribute to field service revenue highlights the areas of opportunity open to field service managers, as shown in Exhibit IV-3.

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EXHIBIT IV-2

MONTHLY REVENUE AND FULLY BURDENED
EXPENSE PER FIELD ENGINEER, 1981-1987
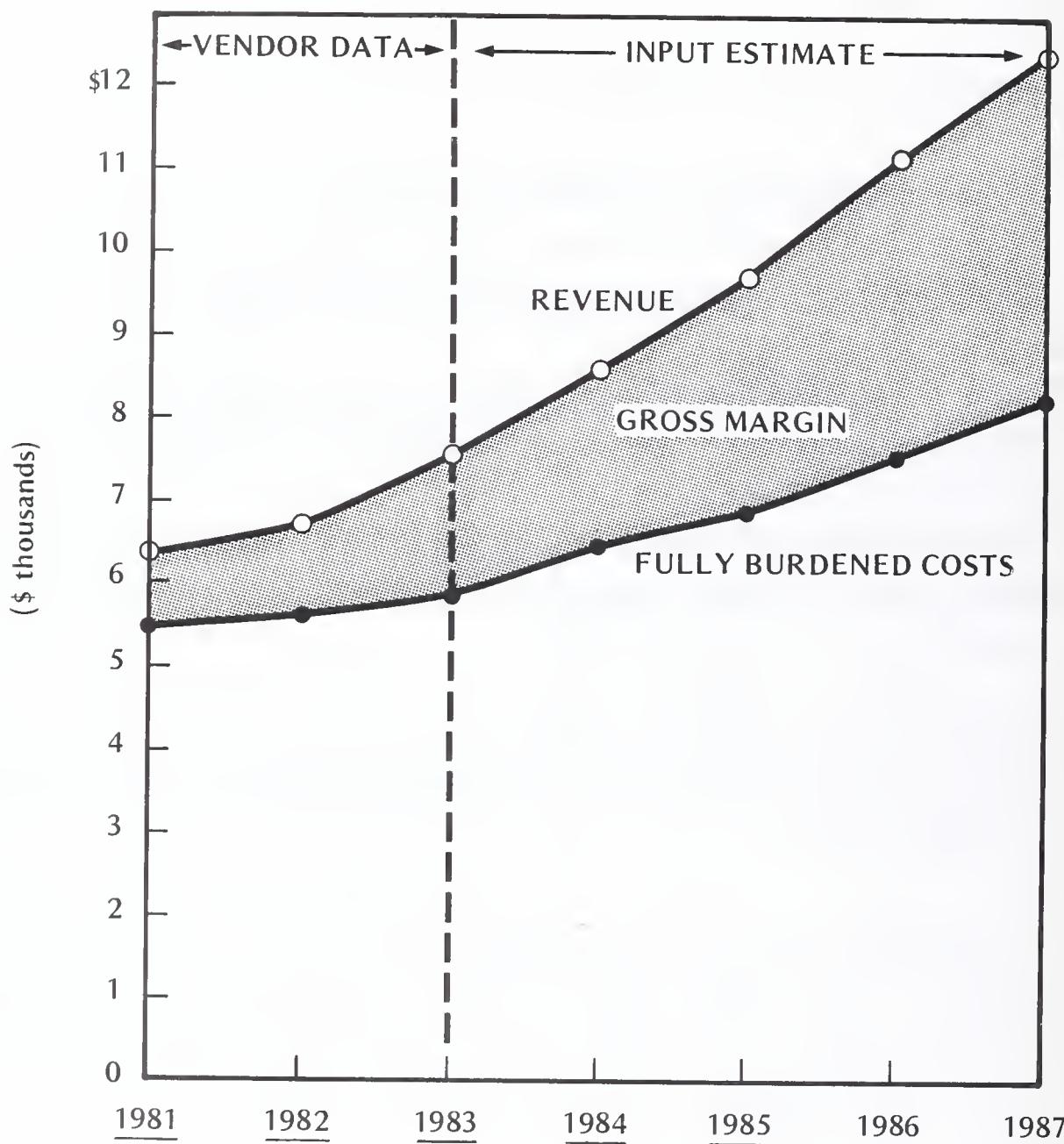
	1981	1982	1983	1984	1985	1986	1987
Revenue/Engineer (dollars)	$6,325	$6,804	$7,573	$8,659	$9,744	$11,080	$12,509
Expense/Engineer (dollars)	5,426	5,509	5,957	6,442	6,996	7,533	8,146
Margin/Engineer (dollars)	899	1,295	1,980	2,217	2,778	3,547	4,363
Engineers/Total (percent)	75%	76%	77%	78%	78%	79%	79%

EXHIBIT IV-3

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SOURCE OF FIELD SERVICES REVENUE, 1982

COMPONENT	PERCENT		RANGE
	Respondents	Average Contribution	
• Hardware and Spares	100%	89%	85-96
• Installation, Relocation and Upgrades	84	2	1-5
• Credits from Sales	37	3	1-5
• Training and Documentation	67	1	1
• Supplies	28	1	1
• System Software	26	1.5	1-3
• Application Software	14	*	-
• Other (e.g. Warranty, FCO Credits)	19	2.5	2-3

*Less than 1%

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- Currently, the placement of hardware at a customer site, whether for initial installation, upgrade, or relocation, gathers more revenue for field service than system software; this is primarily because only a quarter of the field service organizations polled maintain system software.

- Only 37% of the organizations polled give credits to field service for sales of equipment that make service concessions to the user.

- An even smaller percentage (28%) allow field service to handle supplies sales, even though customers are more likely to purchase supplies from field service personnel than they are from a salesman.

- Systems software maintenance will be the fastest-growing single source of field service revenue over the next five years, as more and more vendors transfer this responsibility to field service. This requires organizational planning.

- Applications software is unlikely to follow the same course, remaining with either the user, third-party software house, or vendor support divisions outside field service.

4. TYPICAL FAULT CALL COSTS, 1982-1983

- The analysis of the average cost of a fault call is of value to field service managers since it pinpoints areas of potential savings and tells them how well they are performing in relation to their competitors.

- Maintenance charges are becoming an important part of the user's decision process at sales time and, in conjunction with equipment performance, are already significant to his ongoing satisfaction as a customer.

- The pressure on the field service manager to maintain or improve profitability levels translates into cost control, since revenue is not under his control (FS

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INPUT

managers do not control sales and frequently have little influence on maintenance prices).

- Exhibits IV-4 to IV-7 analyze the per call costs for each equipment category, giving the average dollar cost of a fault call and the proportion of this cost that is spent on labor (direct and travel), parts and materials, travel expense, and overhead. Finally the average number of these calls per FE is shown for the vendor sample.

a. Mainframes

- Mainframe vendors expect per call costs to increase 7.8% in 1983 over 1982 but do not expect any change in the proportion of these costs spent on the various cost components, as shown in Exhibit IV-4.

- They expect a significant increase in the average number of calls handled per week by each engineer, through use of improved diagnostic tools, faster fault isolation, and greater spares availability.

b. Small Business Systems/Minicomputers

- Small systems and minicomputer vendors, on the other hand, expect to be able to control per call costs through broader use of remote diagnostics.

- This is necessary because the volume of systems shipments is unabated, spreading installations farther and farther from support centers.

- As a result the number of on-site visits is being reduced, reducing travel costs, but the average trip duration is increasing, keeping travel labor costs high. The administrative support needed at remote diagnostics and support centers increases the burden overhead.

- The number of calls handled per engineer is three times the number handled by mainframe field service, as shown in Exhibit IV-5.

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EXHIBIT IV-4

MAINFRAME VENDORS' COST BREAKDOWN OF
A TYPICAL FAULT CALL

COMPONENT	1982	1983
Average Cost ($)	$307	$331
Direct Labor (%)	15%	
Travel Labor (%)	9	
Parts and Materials (%)	26	N O C H A N G E
Travel Expense (%)	13	
Burden/Overhead (%)	37	
Number of Calls per Engineer per Week	4.1	5.6

Source: Vendor Interviews

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EXHIBIT IV-5

SMALL BUSINESS SYSTEMS AND MINICOMPUTER VENDORS' COST BREAKDOWN OF A TYPICAL FAULT CALL

COMPONENT	1982	1983
Average Cost ($)	$245	$247
Direct Labor (%)	27%	25%
Travel Labor (%)	21	24
Parts and Materials (%)	14	19
Travel Expense (%)	19	5
Burden/Overhead (%)	19	27
Number of Calls per Engineer per Week	13	17

Source: Vendor Interviews

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EXHIBIT IV-6

TERMINALS VENDORS' COST BREAKDOWN OF
A TYPICAL FAULT CALL

COMPONENT	1982	1983
Average Cost ($)	$132	$147
Direct Labor (%)	22%	24%
Travel Labor (%)	18	19
Parts and Materials (%)	25	21
Travel Expense (%)	11	9
Burden/Overhead (%)	24	27
Number of Calls per Engineer per Week	11.8	14.4

Source: Vendor Interviews

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EXHIBIT IV-7

PERIPHERAL VENDORS' COST BREAKDOWN OF
A TYPICAL FAULT CALL

COMPONENT	1982	1983
Average Cost ($)	$129	$136
Direct Labor (%)	39%	
Travel Labor (%)	16	NO CHANGE
Parts and Materials (%)	27	
Travel Expense (%)	4	
Burden/Overhead (%)	7	
Number of Calls per Engineer per Week	10.8	12.0

Source: Vendor Interviews

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c.   Peripherals

- Peripheral vendors are in line with the mainframe vendors:

    - Increase of 5.4% in per call costs.

    - No change in proportion of costs spent on labor, travel, and overhead in 1983.

    - Measurable increase in the number of calls handled by each FE.

- Like mainframe vendors (but for other reasons), peripheral vendors cannot avoid on-site calls.   Unlike minicomputer vendors, peripheral vendors can make little use of remote diagnostics.

d.   Terminals

- Terminal vendors expect fault calls to rise substantially in 1983, and this rise must be offset by revenue increases.

- Although some travel costs are being controlled, little headway is being made in other areas.   The number of calls per engineer will continue to rise, exceeding those of peripheral vendors and approaching the performance of minicomputer vendors.

5.   PROFIT AND LOSS (P/L) VERSUS COST CENTER

- In 1982, P/L center operation began for a large number of field service organizations, raising the overall proportion of vendors operating this way to 88%, as shown in Exhibit IV-8.

- This proportion has constantly risen since INPUT's first field service study in 1978, but has probably reached a plateau now.

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EXHIBIT IV-8

PROFIT CENTER OR COST CENTER
ORGANIZATION OF RESPONDING VENDORS

Profit Center
- 88
- 74
- 70
- 63.3

Cost Center
- 12
- 26
- 30
- 32.7

Converting Within Three Years
- 21
- 25
- 4

Percent

0   20   40   60   80   100%

☐ 1982 Survey
▨ 1981 Survey
▨ 1980 Survey
■ 1978 Survey

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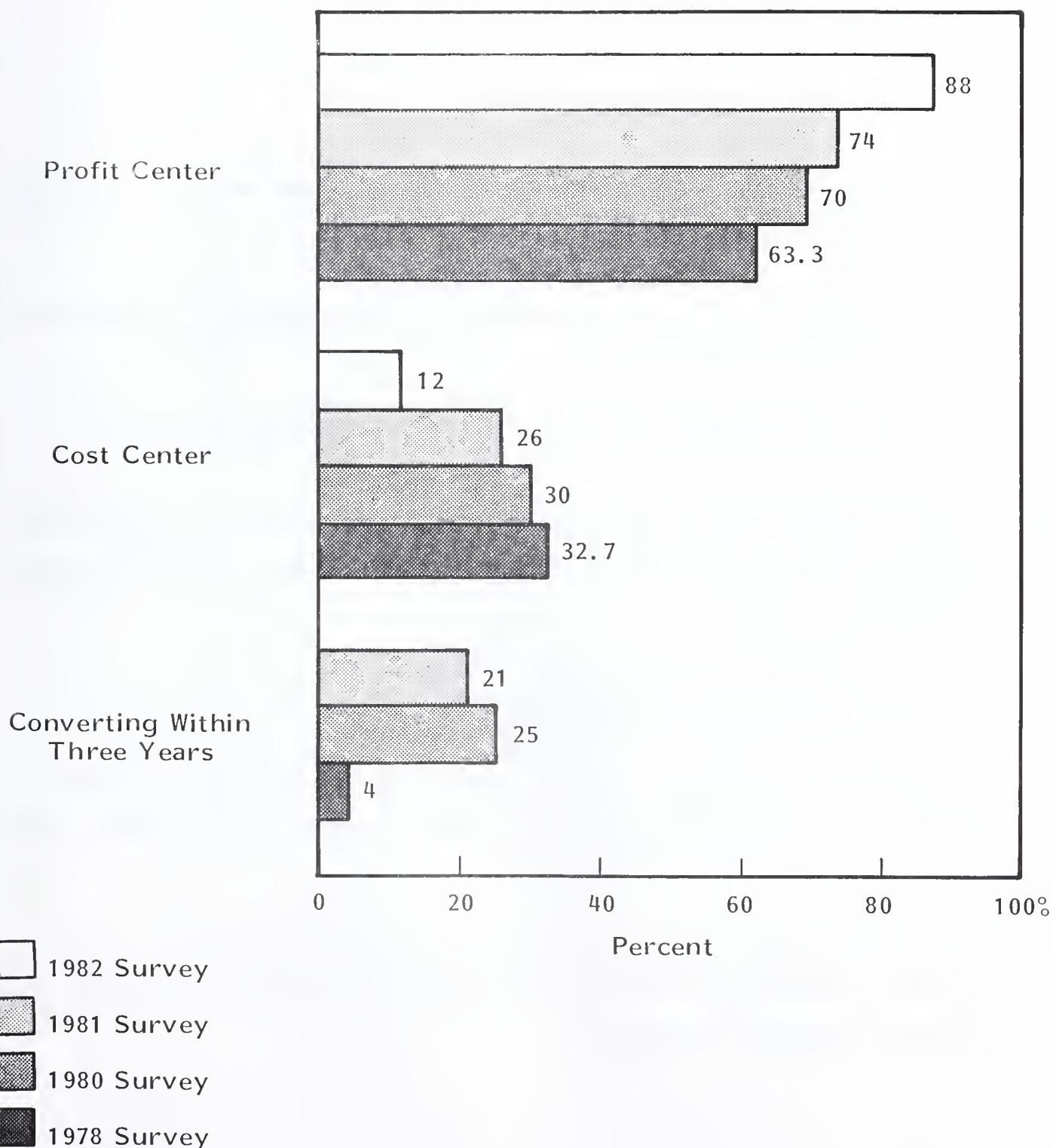
- This is not to say that cost center operation has no place in field service: the entire operations of small startup companies still operate that way, and so do service depots of mature companies (although this is rapidly changing).

- However, attention is now centered on how much P/L control to delegate down the line, as shown in Exhibit IV-9. This can be a partial delegation only.

- The significance of this delegation is fourfold:

  - It pinpoints problem operations.

  - It sensitizes local management to the P/L issue, and creates new goals for them to target.

  - It upgrades the image and status of local managers in their own eyes and broadens their skills.

  - It increases company-wide P/L control through finer analysis.

- A rising proportion of mature vendors have pushed the P/L delegation all the way to branch level. Summary P/L control is retained by the next superior level in all cases.

6. COSTS AND REVENUE TRACKING

- Tracking costs and revenue, long the cornerstone of field service controls, has been taken all the way down to site within customer for 21% of the vendors interviewed, as shown in Exhibit IV-10.

- The next superior level does not always exercise control; i.e., control at product level does not imply control at product line level (in fact it very often implies no product line control).

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EXHIBIT IV-9

PROFIT AND LOSS OR
COST CONTROL DELEGATION

Profit and Loss	88%
Cost Control	12

Profit/Loss Delegation	
Headquarters	55%
Regional	38
District	29
Branch	36
Note: Categories are multiple choice and are not mutually exclusive.	

Source: Vendor Interviews

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EXHIBIT IV-10

COSTS AND REVENUE TRACKING

LEVEL OF CONTROL	PERCENT ACTIVE
Product Line	42%
Product	42
Customer	16
Site	21
Branch	12
District	7
Department	5
Others	14

Source: Vendor Interviews

Note: Categories are multiple choice and are not mutually exclusive.

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- The surprising finding was the high proportion of vendors who are carrying out cost and revenue control by site within major customer – 21%. Combined with the proportion of control carried out at customer level (and eliminating overlap), 28% of installations are controlled at the user level.

- At this stage the installations controlled in this way are generally large or very large customers. Nevertheless, INPUT expects this practice to extend down the installed base over the next five years.

- A minority of vendors continue to withhold control at the field service department or district level. This creates a heavy administrative/reporting load at these points.

- The "other" category includes:

  - Distribution center.

  - City.

  - Strategic business unit (combination of industry sector and company size).

  - Service center.

7. ACCOUNTING TREATMENT OF SPARE PARTS

- There is a broad range of methods for handling spare parts from an accounting standpoint, both within each category of vendor and from category to category.

- Less than 15% of vendors inventory all parts; most expense them below certain value (e.g., $50, $100). The average values are shown in Exhibit IV-11 for each category of vendor.

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EXHIBIT IV-11

ACCOUNTING TREATMENT OF SPARE PARTS

VENDOR CATEGORY	PARTS EXPENSED BELOW		PERCENT OF VENDORS WHO INVENTORY ALL PARTS
	DOLLAR AVERAGE	DOLLAR RANGE	
Mainframes	$79	$50-100	14%
Small Business Systems	59	1-250	9
Minicomputers	145	50-500	14
Microcomputers	90	10-250	–
Terminals	116	1-500	–
Peripherals	77	10-250	8
Word Processors	94	50-250	–
Data Communications	118	15-250	–

Source: Vendor Interviews

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- A selection of the comments provided by vendors on this issue follows:

    - "We inventory repairables and expense expendables."

    - "The problem of obsolete inventories is very important to us; some items are capitalized."

    - "Spares are inventoried at 20% of cost per year, straight line depreciation, indefinitely."

    - "We inventory parts over $50 if they are repairable; if not, whether over or under $50 they are expensed."

    - (Large integrated systems dealer): "If we purchase a part from a vendor we expense it; if we manufacture it ourselves we depreciate it."

    - "All spares are inventoried before shipping to the field; initial spares allocations are amortized over 48 months; reorders are expensed."

    - "We review our inventories every 90 days; parts life expectancy is based on design changes, not on age."

    - "We expense any nonrepairable or consumable part as it is used."

    - "We inventory all boards and modules; everything else is expensed."

B.   ORGANIZATION AND STAFFING

I.   FIELD SERVICE REPORTING

- The growth of field service revenue in relation to overall company revenue and the proportion of margin contributed by field service continues to promote the reporting level of field service organizations.

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- The trend is for field service operations to report to a vice president or FE, who is on a par with (rather than reporting to) the vice president of marketing/sales.

- More and more field service operations now have the ear of corporate planning, and the president of the company. This is likely to have far-reaching effects on product quality and the marketing of field services in the near future.

- Nevertheless, most field service organizations still report to a director of field engineering who is under the vice president of marketing. Seven percent of responding field service organizations have a service marketing manager who promotes the sale of service as a product, examines competitive data, participates in (but does not determine) pricing, and reviews service packaging.

2. FIELD SERVICE PERSONNEL DISTRIBUTION

- The total sample of 45 vendors interviewed included a large proportion of small and medium-sized field service organizations (average 1982 field service revenue $43M; range of 1982 revenue: $2.5M to $400M).

- As a result, the average distribution by function is weighted towards smaller organizations where overhead functions are a higher percentage of total field service personnel.

- Exhibit IV-12 shows the average distribution of responsibilities of the 1982 sample:

    - The 11.4% growth in average number of field service employees between 1982 and plans for 1983 overstates the total industry growth expected (6%), since it is biased towards the smaller, faster-growing company.

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EXHIBIT IV-12

FIELD SERVICE PERSONNEL DISTRIBUTION BY FUNCTION

	1982	1983	CHANGE (percent)
● Sample Total Personnel	23,745	26,448	11.4%
● Average Field Service Employees	678	756	11.5
– Average Number FS Engineers	476	539	13.2
– Average Number Technical Support Engineers	37	41	10.8
– Average Number FS Administrators	77	80	3.9
– Average Number FS Supervisors	61	65	6.6
– Average Number Field Line Managers	27	31	14.8

Total Sample: 35 Vendors

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- The overall growth trends are significant:

  . Faster growth in the number of engineers than in technical support engineers.

  . Decrease in the relative proportion of field service administrators (in line with the trend toward delegation of P/L control down the reporting line).

  . Gradual decrease in the proportion of field service supervisors (eliminating "tiered" hierarchies).

  . Rapid growth of field line managers (with business control responsibilities).

- The sample also showed a steady increase in the average percentage of total field service staff that at any one time is on a training course: in 1982 this was 6.7% of all staff, and in 1983 plans call for 7.2%.

- The number of customer sites with resident engineers is expected to increase by 30% in 1983 and sites serviced by remote diagnostics will triple according to respondents.

- Meanwhile the number of branch offices is expected to increase by 7.7% in 1983.

3. LABOR TURNOVER

- From a total of 33 vendor responses, net new 1981 FE hires (i.e., total new hires minus FEs lost) were 4.8% of total FEs employed. In 1982 net new hires at the end of the first quarter were 0.9% of total FEs employed.

- The comments provided by vendors in explaining their loss of engineers in 1982 make interesting reading:

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- "Recruitment into corporate functions, internal transfers."

- "They want an opportunity to get into management, software, and programming."

- "Our performance this year as a company was not good, so there was no effort made to retain them."

- "Competitive poaching for more money."

- "Family pressures: they didn't like all the travel."

- "We terminated most of them."

- "We hire young people out of school: the nonperformers get terminated."

- "Three reasons: the recession, increased product reliability, and increased productivity."

- "Perception of lack of growth and immediate financial rewards elsewhere."

- "High pressure of alternative job effectiveness."

- "Restructuring: some of the older guys didn't like the changes."

- "Lack of challenge of working on terminals."

- "Slow company growth; concern for company stability."

- "We went to board replacement; FEs got bored."

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4.   TYPICAL FIELD SERVICE SALARIES

•   The 1982 survey established salary ranges for two new categories of field engineering staff - the technical support engineers for hardware and software - who operate out of support centers.

•   Salary increases in 1982 were at a weighted average of 9.4%; i.e., not substantially different from increases given in 1981, even though reduced inflation and employment in other industries have meant stagnant salaries elsewhere.   The demand for FEs has continued even in recession, so that vendors have defensively raised salaries.

•   In 1981, senior engineers benefited most from increases but in 1982 software specialists in technical support were the most favorably treated category as added emphasis on the integration of system software maintenance with hardware maintenance gathered pace, as shown in Exhibit IV-13.

•   Hardware technical support engineers also received good increases, equal to those of line management.

•   The ranges of salary paid to each category of staff continued to rise in value, as shown in Exhibit IV-14, compared to 1981, and in line with the trend established by increases in 1981 over 1980.

5.   FIELD ENGINEERING PERFORMANCE INDICATORS/MEASURMENT TECHNIQUES

•   Real improvements have been implemented by field service management in responding to users' concerns: 38% of vendors interviewed measure first-line managers based on customer satisfaction, as expressed in user surveys commonly carried out on a semi-annual or quarterly basis.

•   Nearly one-half of the vendors include customer satisfaction in the manager's performance criteria, as shown in Exhibit IV-15.

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EXHIBIT IV-13

AVERAGE SALARY RANGES BY FUNCTION

FUNCTION	AVERAGE YEARLY SALARY 1982	RANGE OF SALARY ($ thousands)	PERCENT INCREASE	
			1981	1982
Trainee Engineer	$16,100	13.9-19.2	8.7	8.5
Qualified Engineer	20,400	17.3-23.5	8.9	8.9
Senior Engineer	23,100	22.6-28.3	11.6	9.3
Technical Support H/W	26,200	25.1-32.7	9.0	9.9
Technical Support S/W	27,300	23.3-33.2	9.6	10.1
Supervisor	28,300	23.6-31.6	8.7	8.7
Line Manager	29,900	25.8-39.9	9.7	9.9

Source: Vendor Interviews

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EXHIBIT IV-14

COMPARISON OF AVERAGE ANNUAL SALARY RANGES BY FUNCTION, 1980-1982

Note: Line on 1982 ranges indicates average salary paid.

Legend:
☐ = 1980   ▨ = 1981   ▨ = 1982

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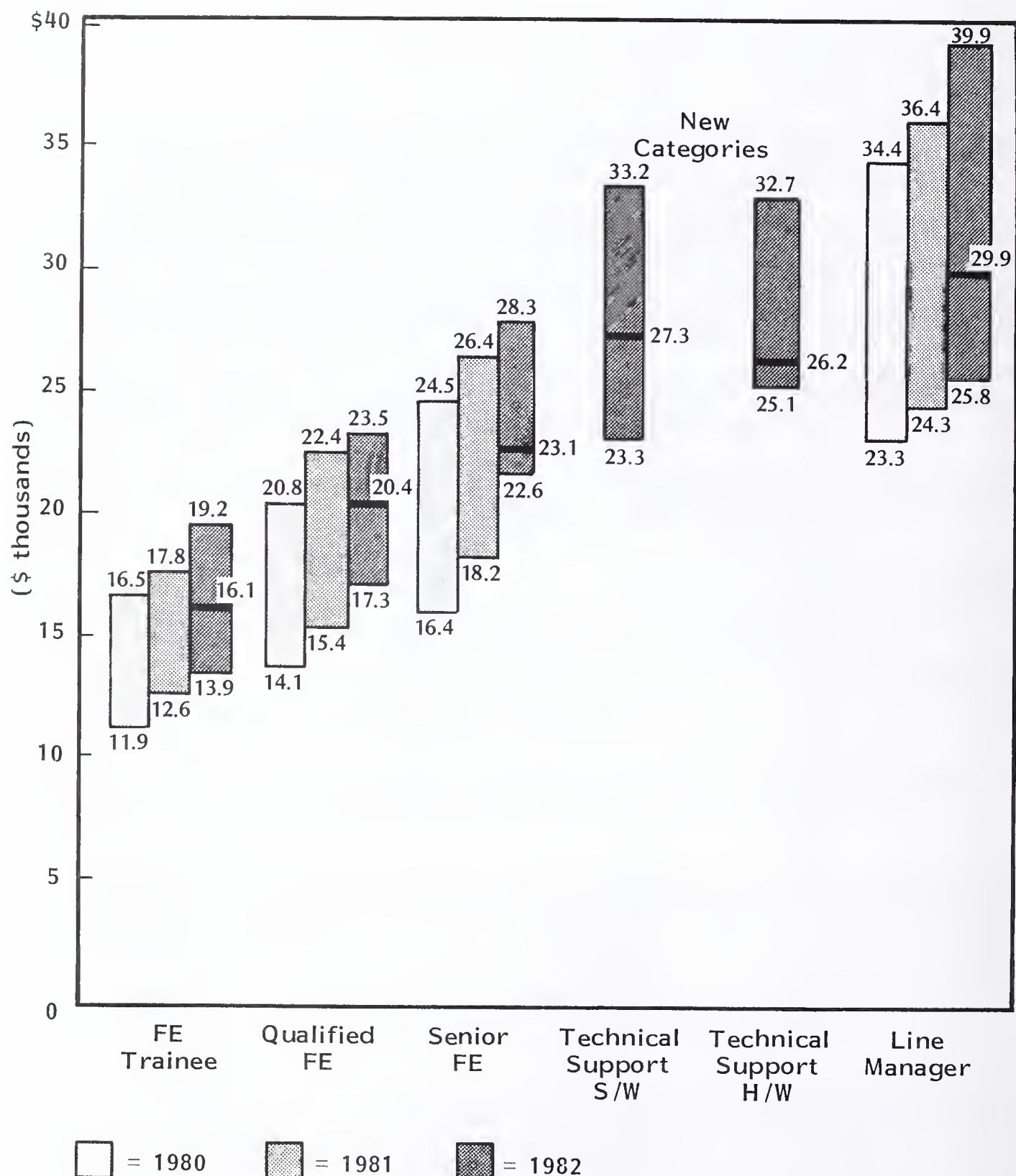
EXHIBIT IV-15

FIRST LINE MANAGERS' PERFORMANCE MEASUREMENT

RANK	CRITERION	FIRST PRIORITY (percent)	SECOND PRIORITY (percent)	ALL MENTIONS (percent)
1.	Customer Satisfaction	38%	7%	47%*
2.	Profit and Loss or Budget Control	19	21	47*
3.	Response Time	12	5	17
4.	Parts Usage/Inventory Control	5	2	14*
5.	Other (MBO, MTTR, Customer Complaints, Cumulative Downtime)	14	51	N/A
6.	No Measurement	12	14	N/A
	TOTAL	100%	100%	N/A

* NOTE: "All mentions" may be greater than sum of first and second mentions (if more than two levels of measurement are used).

Sample: 42 Vendors

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- The second most important issue is P/L or budget control, expressed either as margin contribution or specifically itemized into revenue and cost controls.

- In measuring line managers, the P/L concern has overall value equal to customer satisfaction.

- Response to customer calls, and parts usage/inventory control are still frequently used as measurement tools, as is turnover in the number of FEs reporting to the manager (not mentioned in Exhibit IV-15 because it always occurs as a third or lesser priority). The line manager must keep customers, his own staff, and his manager happy - not an easy task.

- A small but significant percentage of vendors (10%) include a measurement of maintenance contract sales, closing calls, or personal salesmanship as line manager control criteria.

C.   FIELD SERVICE PRICING

1.   PRICING METHODOLOGY

- The pricing methodology used by vendors is easily classified into three major areas:

    - Cost-based pricing (bottom up).

    - Sales value-based pricing (top down).

    - Market-based pricing (either IBM price umbrella, competition, or "what the market will bear").

- Exhibit IV-16 outlines the thought process used in each of the above three areas.

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EXHIBIT IV-16

PRICING METHODOLOGY

RANK	PRINCIPAL STARTING POINT	PERCENT RESPONDENTS	MODIFIED FOR:
1.	**COSTS** — Fully burdened costs based on measured MTBF, MTTR, actual costs of spares, and cost of delivery mode.	51.2	Fixed margin (20.3) — What competition is charging (11.6) — Other (e.g., corporate objectives) 18.7 → Adjusted For → What market will bear — Accepted percent of sales value
2.	**SALES VALUE** — Percent of sales value, either fixed by product line or type of product.	30.2	Actual costs, when known 9.3 — Competition 7.0 — Other (e.g., Impact of customer cost of ownership) 13.9
3.	**COMPETITION** — What competition is changing	9.3	Viability of costs
4.	**OTHER** — E.g., what market will bear, IBM price umbrella etc.	9.3	Various

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FA82

- Margin adjustment of costs varies from vendor to vendor: some add a gross margin between 25% and 40% to fully burdened costs; some multiply direct costs by 300%; others start from basic costs, work up to standard maintenance hours per device or system and then multiply by hourly charge-out rates per engineer.

- Sales value percentages (varying from eight to 18) are often used at the initial stage of a product's launch when actual field repair costs are not known. Thereafter adjustments are made on a cost-plus basis.

- One vendor wisely noted that list-price was the basis for calculation of service charges, not sales price (which is affected by discounts and other variables).

- A significant proportion of vendors simplify the whole process to "one percent of sales value per month" and hope that revenue more than offsets costs.

- The percentage of sales price can be finely tuned by high frequency breakdown items, vintage of products maintained, complexity of equipment, density of installed base, or service delivery method.

- Some service managers can control geographic dispersion of products based on service costs: "if we can't break even at competitive maintenance rates, we won't sell the product."

- Others have adopted a more supple approach taking into account not only costs, competition, and percent of sales value, but also level of support (value customer receives), cost of delivering that level of service, and the impact of maintenance charges on the customer's cost of ownership.

2. MAINTENANCE PRICING BY EQUIPMENT CATEGORY

   a.   Large Mainframes

- Annual maintenance of large mainframe computers has been typically priced at 2% to 4% of sales price, with the exception of Amdahl who has priced

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service in the 5% to 8% range. This is the result of Amdahl's pricing maintenance in accordance with costs, while aggressively pricing its hardware. Contract response times for all vendors are typically two hours.

- Reductions in purchase prices and third-party maintenance pressure have reduced the absolute values of both purchase price and service charges, but the ratio of the two has stayed fairly constant.

- In 1982, the average reported was 1.9%.

- Contract notice periods for increases in charge rates range from 60 to 90 days with the latter prevalent.

- Over the 1981-1982 period, price increases averaged 5.5%. Forecast increases over the next 12 months will average 5%. Vendors see 10% as the point where users would balk.

- Exhibit IV-17 details some of the more prominent large mainframes and their maintenance charges.

b.   Medium Mainframes

- This is an area which has seen dramatic improvements in service pricing, introduced by IBM with the 4330/4340 line. These improvements have not yet been duplicated by other vendors competing in the same markets, except for Burroughs, as shown in Exhibit IV-18.

- Annual service charges are typically in the 3% to 8% of sales value range, with the 1982 all-vendor average at 5.7%. Contract response times are typically two to four hours with a preponderance of two-hour contracts.

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EXHIBIT IV-17

MAINTENANCE PRICING OF SELECTED VENDORS OF LARGE MAINFRAMES

VENDOR	MODEL NUMBER	MEMORY SIZE OF BASIC CONFIGURATION	FIRST SHIPPED	AVERAGE PURCHASE PRICE	AVERAGE MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
Amdahl	470 V/8	16 MB	1979	$2,525,000	$16,950	8.1%
Burroughs	B7850	6 MB	1980	3,150,000	9,900	3.3
CDC	Cyber 176	1.31 Million Characters	1976	4,426,800	13,537	3.7
Honeywell	DPS 8/70 M	4 MB	1982	2,054,919	8,772	5.1
IBM	3033 U	16 MB	1978	2,229,000	7,280	3.9
IBM	3081 K16	16 MB	1982	4,520,000	8,375	2.2
NAS	AS/9000N	4 MB	1981	1,995,000	7,161	4.3
UNIVAC	1100/80	4 MB	1977	2,293,000	5,543	2.9

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EXHIBIT IV-18

MAINTENANCE PRICING OF SELECTED VENDORS OF MEDIUM MAINFRAMES

VENDOR	MODEL NUMBER	MEMORY SIZE OF BASIC CONFIGURATION	FIRST SHIPPED	AVERAGE PURCHASE PRICE	AVERAGE MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
Burroughs	B 5930	1.5 MB	1981	$210,000	$600	3.4%
CDC	480-II Omega	1.05 MB	1978	279,000	1,915	8.2
DEC	VAX 11/780	1 MB	1977	219,100	1,137	6.2
Honeywell	DPS 80/20	2 MB	1980	483,748	2,456	6.1
IBM	4331 Group I	4 MB	1979	197,000	381	2.3
IBM	4341 Group I	12 MB	1979	516,000	1,139	2.7
Perkin-Elmer	3250	16 MB	1979	200,000	2,000	12.0
UNIVAC	1100/62	4 MB	1980	938,254	3,499	4.5

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- Contract period of notice for maintenance price increases is evenly split between 60 and 90 days. The average increase over the 1981-1982 period was 6.2%. In the 1982-1983 period the average increase is planned at 6.5%.

- Vendors feel that increases of around 10% would create difficulties with the user groups.

c. Small Business Systems And Minicomputers

- Typical annual service charges for this category of equipment are in the 6% to 11% range for small systems/minicomputers over $25,000 sales price and 8% to 12% for systems over $25,000 sales price, as shown in Exhibits IV-19 and IV-20. In 1982 average maintenance charges for small business systems were 9.2% and 10.4% for minicomputers. This is for a four-hour response contract.

- Contract periods of notice for price increases are varied, ranging from 30 days to one year (predominantly 90 days).

- Over the 1981-1982 period, service price increases were in the 5% to 17% range, averaging 7%. The forecast average increase over the next 12 months is 7.7% for small business systems and 8.2% for minicomputers.

- The user flashpoint is considered to be an increase of around 19%.

d. Microcomputers

- There is no clear history of microcomputer maintenance charge and certainly no norm established as yet. Annual charges range from a low of 7% to a high of 24% of sales price.

- Contract response times are nominally four hours, but a high proportion of microcomputer users have no service contract at all. They rely on warranty service for the first six or 12 months and on carry-in, time and materials service from the dealer thereafter.

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EXHIBIT IV-19

MAINTENANCE PRICING OF SELECTED VENDORS OF SMALL BUSINESS
AND MINICOMPUTER SYSTEMS UNDER $25,000

VENDOR	MODEL NUMBER	MEMORY SIZE OF BASIC CONFIGURATION	FIRST SHIPPED	AVERAGE PURCHASE PRICE	AVERAGE MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
IBM	System/32	8 KB	1975	$23,490	$168	8.6%
Texas Instruments	DS 990	64 KB	1979	9,995	114	13.7
Wang	VS-100	256 KB	1977	22,000	235	12.8
Basic Four	System 200	40 KB	1978	24,990	260	12.5
Burroughs	B 90	128 KB	1979	7,900	56	8.5
NCR	8150	32 KB	1978	18,300	192	12.6
Hewlett Packard	3000/30	256 KB	1979	24,925	220	10.6
DEC	Data System 336	128 KB	1980	25,000	242	11.6

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EXHIBIT IV-20

MAINTENANCE PRICING OF SELECTED VENDORS OF SMALL BUSINESS COMPUTERS

AND MINICOMPUTERS OVER $25,000

VENDOR	MODEL NUMBER	MEMORY SIZE OF BASIC CONFIGURATION	FIRST SHIPPED	AVERAGE PURCHASE PRICE	AVERAGE MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
Data General	CS-50 Model C5	128 KB	1980	$37,000	$262	8.5%
Data Point	8630	256 KB	1981	33,500	240	8.6
DEC	Data System 356	256 KB	1980	41,900	288	10.6
Hewlett Packard	3000/40 SX	256 KB	1982	42,100	320	9.1
Honeywell	DPS 6/48	512 KB	1981	116,060	814	8.4
IBM	System 38 Model 03 21	512 KB	1980	59,210	358	7.3
Perkin-Elmer	8/32	1 MB	1978	100,000	750	9.0
Prime	150/II	256 KB	1981	54,000	272	6.0

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- For the contracts in use, a notice period for price increase of 30 days to one year is used with no clear majority in favor of one extreme or the other.

- Price increases over the last 12 months have averaged 5.6%. Over the next 12 months, prices are expected to rise 6.8%.

- Vendors have no clear idea of an upper, unacceptable limit of price increase.

e. Peripherals

- Annual maintenance charges for peripherals range from 4% to 15% of sales price for response times ranging from four hours to 24 hours. Response times greater than eight hours apply to peripherals sold by third-party vendors.

- Contract periods of notice of maintenance price increase are usually 90 days with isolated instances of 30, 45, and 60 days.

- Exhibits IV-21 and IV-22 provide comparisons of printer, tape, and disk unit maintenance charges practiced by selected vendors.

- Service price increases over the 1981-1982 period averaged 7.8% and are expected to average 8.6% over the next 12 months.

- Unacceptable levels of increase are gauged (by vendors) to be in the 17% area.

f. Terminals

- Annual maintenance charges range from 10% to 19% of purchase price, averaging 13.9% for responding vendors. This applies to contract response times ranging from four hours to 24 hours, similar to peripherals.

- Exhibit IV-23 details the charges for selected vendors' terminals.

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EXHIBIT IV-21

MAINTENANCE PRICING OF SELECTED VENDORS OF FAST PRINTERS

VENDOR	MODEL NUMBER	PRODUCT DESCRIPTION	FIRST SHIPPED	PURCHASE PRICE	MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
IBM	1403 N1	1100 lpm	1978	$ 40,040	625	18.7
IBM	3800	Up To 20,040 lpm	1978	373,150	938	3.0
CDC	580/200	2000 lpm	1977	91,956	797	10.4
Honeywell	PPS II/E	18,000 lpm	1981	240,745	1,697	8.5
Honeywell	PRU 1600	1600 lpm	1974	$ 64,940	1,538	28.4

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EXHIBIT IV-22

MAINTENANCE PRICING OF SELECTED VENDORS OF TAPE AND DISK DRIVES

VENDOR	MODEL NUMBER	PRODUCT DESCRIPTION	FIRST SHIPPED	PURCHASE PRICE	MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
Honeywell	MTU 0610	Tape	1980	$21,000	122	7.0
Honeywell	MSU 0501	Disk	1979	49,650	197	4.8
CDC	858/11	Disk	1980	59,900	166	3.3
CDC	679-6	Tape	1978	31,540	134	5.1
STC	3670	Tape	1974	26,312	343	15.6
STC	8650 A2	Disk	1979	60,880	251	5.0
IBM	3370 A1	Disk	1978	29,550	94.50	3.8
Univac	8470	Disk	1979	87,200	327	4.5

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EXHIBIT IV-23

MAINTENANCE PRICING OF SELECTED VENDORS OF TERMINALS

VENDOR	MODEL NUMBER	PRODUCT DESCRIPTION	FIRST SHIPPED	PURCHASE PRICE	MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
CDC	751-10	CRT	1979	$1,995	$30	18.1
Honeywell	VIP-7100	CRT	1976	1,500	23	18.4
IBM	3278 2A	CRT	1978	2,505	22.50	10.8
IBM	3279 2C	Color CRT	1978	4,525	39.50	10.5
Univac	UTS-20	CRT	1980	$2,597	28	12.9

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- Contract period of notice for price increases is normally 90 days. In the last 12 months, service price increases averaged 6.7% but over a wide range (from 0% to 15%). Forecast increases for the next 12 months average 7%.

- The user flashpoint for unacceptably high service price increases is around 17%, according to vendors.

g.   Word Processors

- Annual maintenance charges average 8.4% of sales price for four-hour contracted response. The contract period of notice for charge increase is usually 30 days.

- Exhibit IV-24 provides a comparison of the service charges practiced by the principal competition in the word processor market.

- In the 1981-1982 period these increases averaged 8%. In the next 12 months they are forecast to average 8.2%.

- The vendors believe an unacceptably high increase for word processor service is around 19%.

h.   Executive Workstations

- Annual service charges for workstations averaged 9.4% in 1982 for a four-hour response contract, up an average of 6.5% over 1981.

- Price increases in 1983 are expected to average 9.9%. Vendors believe an increase of around 18% would be unacceptable to users.

i.   Data Communications Processors

- Annual service charges averaged 6.7% of sales price in 1982. Service charges increased 8.2% over 1981. Contract responses range from two hours to 48 hours.

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EXHIBIT IV-24

MAINTENANCE PRICING OF SELECTED VENDORS OF WORD PROCESSORS

VENDOR	MODEL NUMBER	FIRST SHIPPED	AVERAGE PURCHASE PRICE	AVERAGE MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
CPT	8100	1981	$13,965	$95	8.2%
IBM	Display Writer	1981	12,360	114.50	11.1
NBI	3000s	1982	13,200	87	7.9
	System 8	1980	22,200	179	9.7
Wang	Wangwriter	1980	6,400	75	14.1
Philips	MICOM 2002	1980	15,870	142	10.7
Xerox	860	1980	12,625	100	9.5

- Price increases in 1983 are expected to average 8.6%. Vendors believe users would not accept increases in the 20% range.

- Exhibit IV-25 compares the service charges of selected vendors for communications processors, ranging from 5% to 11%.

3. PRICE REDUCTIONS BY DELIVERY MODE

- One important aspect of maintenance costs to vendors is the mode of delivery of the service; e.g.:

    - Carry-in/mail-in (by user).

    - Device swapout (by user).

    - Pickup and delivery (by third party).

- Or special conditions that help reduce vendor costs; e.g.:

    - Cluster maintenance (multiple systems at one site).

    - User self-maintenance.

    - Customer-owned parts.

- Vendors were asked what level of reductions they apply to each of these, and the results are summarized in Exhibit IV-26.

- Carry-in/mail-in by users obviates the need for an on-site visit by the vendor. It also implies that the user accepts reduced response time due to transportation delays and does not expect immediate repair.

- Compensation offered to users for these vendor cost reductions is high, averaging 35% of normal service rates.

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EXHIBIT IV-25

MAINTENANCE PRICING OF SELECTED VENDORS OF COMMUNICATIONS PROCESSORS

VENDOR	MODEL NUMBER	PRODUCT DESCRIPTION	YEAR INTRO-DUCED	AVERAGE PURCHASE PRICE	24HR/7DAY MONTHLY MAINTENANCE CHARGE	ANNUAL MAINTENANCE AS PERCENT OF PURCHASE PRICE
Amdahl	4705	64 lines 64 KB	1980	$54,300	490	10.8
IBM	3705-II	"	1979	59,600	268	5.4
Honeywell	Datanet 6661	"	1980	48,805	261	6.4
Univac	DCP/40	128 KB	1979	62,815	292	5.6
CCI	3650 II	64 KB 16 lines	1979	42,645	212	5.0
NCR	721-II	128 KB 14 lines	1978	56,700	390	6.9

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EXHIBIT IV-26

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PRICE REDUCTIONS BY DELIVERY MODE

DELIVERY MODE	PERCENT OF VENDORS OFFERING	PERCENT REDUCTION OFFERED	
		Average	Range
Carry-In/Mail-In	33%	35%	5 - 50
Device Swapout	19	28	10 - 60
Pickup/Delivery	5	9	4 - 14
SPECIAL CONDITIONS			
User Self-Maintenance	21	37	15 - 60
Cluster Maintenance	5	13	13
Customer-Owned Parts	2	15	15

Total Sample: 43 Vendors

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- Device swapout applies to self-diagnosing equipment (or remotely diagnosed equipment), where user staff replaces the failed part with an equivalent from a kit of spares left for this purpose by the vendor. A further refinement of this situation is for the customer to purchase the kit of spares.

- Pickup/delivery corresponds to situations where user agrees to consign his equipment to a third-party transporter. This eliminates the need for a service center near the customer's site and allows remote, centralized (and depot) maintenance, reducing travel labor of specialized maintenance staff and automobile costs.

- Cluster maintenance reductions recognize the benefit to the vendor of single visits for multiple systems. This is partially returned to the customer as a rebate.

- User self-maintenance covers a wide range of self service, and the range of discounts is correspondingly wide. At one end of the scale it is another name for device swapout, and at the other end it is full responsibility for equipment service with the vendor as parts wholesaler.

4. MARKETING OF FIELD SERVICE CONTRACTS

- Today's market shows a trend towards partial customization of service contracts to each category of user. Single contract service is principally found in startup situations (new vendors) or in new markets (e.g., personal computers).

- The packaging of service, as a product, and the attendant analysis of competitive offerings are traditional marketing functions. For this reason many vendors, after deciding to market field services, place the responsibility in the hands of marketing/sales.

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- This is not a good solution to the problem. Marketing/sales perceive field service as a necessary evil - the concept of marketing such a service does not come easily.

- Marketing/sales' understanding of field service is limited; how can they meaningfully package a product that they do not understand? The motivation for field service product marketing campaigns (and for sales to sell clean service contracts) is not yet established.

- On the other hand, it is not advisable to give field service the entire responsibility for marketing its products: the workings of marketing are as strange to field service as field service is to marketing.

- It appears that most vendors have come to the same conclusions:

    - Sixty-three percent of responding vendors make field service and marketing jointly responsible for marketing field service products.

    - Sixteen percent place the responsibility solely in the hands of field service.

    - Fourteen percent make marketing responsible.

    - Seven percent delegate the responsibility to third parties (principally dealers, and turnkey houses).

D.   EQUIPMENT DISTRIBUTION BY TYPE OF ENVIRONMENT

- A key aspect of designing reliability into any product is the definition of the quality of the environment in which the product is expected to perform. Environmental factors such as heat, humidity, and power source can change within the limits defined for the environment.

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- One might think that the type of environment can be inferred from the equipment category. This is not always the case, however, as shown in Exhibit IV-27.

1. MAINFRAME SYSTEMS

- In past years a mainframe system would almost always be found in a dedicated environment: one that had specific temperature, humidity, dust particle, and power controls tailored to the specification of the mainframe it was serving. (In some well-known cases this included costly plumbing for water-cooled CPUs.)

- More recently, minicomputer-based mainframe equivalents have added environment cost savings to their significant price advantages. Equivalent power, lower price, and less specialized environments were needed (operating in normal air-conditioned offices).

- This year's survey showed 27% of installed mainframe systems and their equivalents in office environments. This proportion is bound to increase in coming years, and vendors must design for it.

2. SMALL BUSINESS SYSTEMS

- Almost the reverse situation applies to small business systems. Originally designed for the office (with the notable exception of the disk drives), many of these systems are being colocated with the mainframe(s) in dedicated environments.

- These systems may serve as dedicated application systems or satellite processors and may have no direct link with the neighboring mainframe. In some cases they may be part of a separate EDP budget, but since they are DP equipment they are placed in the DP room.

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EXHIBIT IV-27

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EQUIPMENT DISTRIBUTION
BY TYPE OF ENVIRONMENT
(percent)

EQUIPMENT CATEGORY	DP ROOM	OFFICE	PLANT /FACTORY
Mainframes	69%	27%	4%
Small Business Systems	26	67	7
Minicomputers	44	45	11
Microcomputers	20	78	2
Word Processors	7	93	0
Executive Workstations	9	87	4
Peripherals	36	51	13
Terminals	19	67	14
Data Communications	41	46	13

Source: Vendor Interviews

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- Plant and factory administration and decision control systems (e.g., inventory control, parts invoicing) sometimes call for installing small business systems in semihostile factory environments.

3. MINICOMPUTERS

- With the exception of peripherals and terminals, the minicomputer is the most versatile of the computer products marketed today. It spans the range of information handling needs from EDP to office automation to process control.

- As a result, environments for the minicomputer are diverse:

    - The increasing penetration of the minicomputer into traditional mainframe markets accounts for the high proportion of minicomputers found in dedicated environments (the higher performance models require some tailoring of the environment to handle temperature and dust).

    - Hostile environments house 11% of installed systems.

4. MICROCOMPUTERS

- The role of the microcomputer has been, to date, the cost-effective execution of application- or function-specific tasks to support overall information processing needs. With the development of greater processing power, however, the micro has begun absorbing minicomputer tasks - and markets.

- The micro, with no unusual environmental requirements, is being freely used by office professionals as a cheap and accessible means of satisfying their personal information processing needs.

- The typical environment is therefore the office. However, because they are cheap, micros are used in a variety of functions subsidiary to a mainframe (e.g., intelligent workstation, data capture preprocessing, intelligent terminal functions).

5.   WORD PROCESSORS

- By definition word processors should be found in the office environment, and this was confirmed by the study (93%). Only 7% of them are colocated with DP equipment.

6.   EXECUTIVE WORKSTATION

- The executive workstation (also known as integrated workstation (IWS) or application workstation (AWS)) combines the power, high level languages, and storage of a minicomputer, with the price of a personal computer, the application dedication of a microcomputer with the local and remote network capabilities of an intelligent terminal.

- This relatively new market is almost exclusively an office requirement, although cost has again determined that the executive workstation has replaced some intelligent terminals in the DP room.

- They are not designed for hostile environments but are nevertheless being sold into plant/factory environments. This will cause severe reliability problems.

7.   PERIPHERALS, TERMINALS, AND DATA COMMUNICATIONS EQUIPMENT

- Initially designed for DP room environments, peripherals are now sold across the board in all environments. Along with terminals and data communications equipment, they are frequently placed in hostile environments as remote I/O stations, collecting and distributing data in environments that the processing system itself could not endure.

- Adjusting for this change has not always been easy. Disk units still cannot perform in true office environments where dust and static electricity are commonly at higher levels than the manufacturer's tolerance.

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- Few general purpose terminals are designed to withstand the plant/factory environments they are often placed in.

- DC equipment does not have to be fully exposed to the surrounding environment but is vulnerable to the power variations in plant/factory environments.

E.   FIELD SERVICE MANAGEMENT PERFORMANCE

- In order to assess the performance of field service management over the 1981-1982 period, the principal problem areas that field service managers spent their time on in 1981-1982 were identified.

- Their own evaluation of their success in solving problems found in the 1981 survey was then obtained along with qualitative assessment of improvements in equipment system availability response/repair times and mean time between failure (MTBF).

- Finally the field service manager's view of the most significant field service industry developments in 1981 was tabulated against anticipated developments in the year in progress.

1.   PRINCIPAL ACTIVITIES FOR FIELD SERVICE MANAGERS, 1981-1982

- The rating of 15 key activity areas of field service managers was assessed on a scale of 1 = low, 10 = high.

- Fourteen of these activity options were fixed by the questionnaire but a consistent mention in the "other" category was profitability and budget control.

- The top vendor priority in 1982, as shown in Exhibit IV-28, has not changed from that of 1981: profitability of service operations. Of equal importance is

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EXHIBIT IV-28

PRINCIPAL ACTIVITIES OF FIELD SERVICE MANAGERS IN 1981

AND PLANS FOR 1982

ACTIVITY	CLASSIFICATION BY AMOUNT OF TIME SPENT IN YEAR	
	1981	1982
Profitability	8.89	8.27
Response Time	8.18	8.27
System Availability	7.86	8.24
Equipment Reliability	7.74	8.27
Repair Time	7.50	7.88
Retaining Engineers	7.30	7.54
Price of Maintenance Services	6.51	7.18
Escalation Procedures	5.39	6.24

Source: Vendor Interviews

Rating: 1 = LOW, 10 = HIGH

Note: Refer to Appendix for Actual Ratings Detail

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response time, and users agree with this. Whether this takes the form of on-site visit, remote diagnostic, or concerned telephone call, the important thing to the user is that he feels his problem is known to the vendor and is being processed.

- In 1981 the next problem in terms of time spent by field service management was system availability, a user-driven issue. In 1982, equipment reliability overtook system availability to become of equal importance to response time and profitability.

- Reliability is a design issue directly affecting field service profitability, in addition to company image and product competitiveness, in the user's eyes.

- This has always been the case, but in earlier years the pressures of market share expansion in a buoyant computer market no doubt relegated it to a position of lesser importance.

- In today's tight market, competitiveness, responsiveness, and profit have combined to bring reliability to the fore.

- The other issues selected by field service management have not changed in 1982 from the positions held in 1981, as shown in Exhibit IV-28.

- They are a combination of vendor-sensitive and user-sensitive issues:

<u>ISSUE</u>

Repair time	User-driven
Retaining engineers	Vendor-driven
Price of maintenance services	User- and vendor-driven
Escalation procedures	User-driven

2.   SUCCESS IN RESOLVING 1981 PROBLEMS

- In this analysis, field engineering managers were asked to rate themselves on their own efficiency in dealing with (and resolving) key 1981 issues.

- This has to be a somewhat subjective analysis. No single problem was rated at less than five (average success), which clearly suggests that field service managers have a high opinion of their success at handling problems.

- The interpretation of Exhibit IV-29 has to be combined with the percentage of vendors who have implemented action pleas for the problem examined. For example, only 52% of vendors do their own service of DC products (the rest rely on the product manufacturer to service the client).

- This is not a satisfactory solution for the vendor (whose entire system performance can be affected by poor DC maintenance) or the user (sorting out whose problem it is when a failure occurs).

- Exhibit IV-29 suggests the following in conjunction with IV-28.

    - A lot of time was spent over the 1981-1982 period concentrating on profitability and cost control; this effort paid off - on average, vendors succeeded at living within budget limitations.

    - The field service workforce was expanded; engineers were trained in new products and techniques; overall technical competence was improved, and staff were retained to a satisfactory degree.

    - Some difficulties were experienced in improving product quality; this has now become a hot topic within corporate planning.

    - Spare parts shortages continue to be of concern.

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EXHIBIT IV-29

FIELD SERVICE MANAGERS' EVALUATION OF
THEIR SUCCESS IN HANDLING PROBLEMS

RELATIVE SUCCESS	PROBLEM	AVERAGE ACTUAL RATING	IMPLEMEN- TATION (percent)
1	Living Within Budget limitations	8.39	95%
2	Training Field Service Engineers	7.90	93
3	Meeting Customer Demands	7.79	98
4	Providing Competitive Salary/ Compensation	7.69	93
5	Recruiting Field Service Engineers	7.65	90
6	Reducing Turnover of Staff	7.45	90
7	Improving FE Technical Competence	7.40	93
8	Improving Product Quality	7.03	90
9	Maintaining Data Communications Products	7.00	52
10	Making Adequate Diagnostic Equipment Available	6.92	81
11	Reducing Spare Parts Shortages	6.59	95
12	Marketing Field Service	6.18	81
13	Providing Adequate Remote Diagnostics	6.12	62
14	Maintaining Products Through Distributors	5.50	55

Rating: 1 = Low, 10 = High

Source: Vendor Interviews

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- Field service is still not marketed by a significant proportion of vendors (19%), and is not accomplished satisfactorily by vendors active in this area.

- Remote diagnostics, implemented to an even lesser degree (62%), is also not adequately organized.

- Barely more than half of the vendors employ distributors for product maintenance, and those that do are not satisfied with the results.

- Having examined the current problems of field service managers and analyzed their success in handling 1981 issues, let's look at their influence and involvement as managers in critical issues within their respective organizations.

3. INVOLVEMENT AND INFLUENCE OF FIELD SERVICE MANAGEMENT IN CRITICAL ISSUES, 1981-1982

- The influence wielded by field service managers can be evaluated by looking at the crucial issues that they were involved in over 1981-1982, and the importance they themselves attached to those issues.

- This evaluation covers several issues that coincide with problem areas and others that are more policy/decision-oriented. This section answers the question of where field service managers have influence.

- Significantly, the first two issues are operational, and the next three are concerned with revenue, as shown in Exhibit IV-30.

- Selection of test equipment, the number one choice in 1981, and spares requirements levels, the number one choice in 1982, are both important to repair time. Although the key issue governing response time, geographical marketing (or where the sales force is allowed to sell product), is still not heavily influenced by field service management, this is improving.

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EXHIBIT IV-30

INFLUENCE OF FIELD SERVICE MANAGEMENT ON
CRITICAL ISSUES, 1981-1982

ISSUE	1981 RATING	1982 RATING
Selection of Test Equipment	7.46	7.73
Spare Requirements Levels	7.08	8.18
Pricing of Field Service	6.24	7.55
Contractual Terms/Acceptability	6.11	7.04
Sale of Field Services	5.87	6.56
Serviceability Design	5.64	7.32
Site Environment Acceptability	5.34	6.35
User Education	5.08	5.69
Equipment Specification	4.70	5.71
Nonbuilt-in Diagnostics	4.70	5.95
Built-in Diagnostics	4.67	6.18
Order Acceptance	4.44	5.18
Equipment Design	4.24	5.73
Geographical Marketing	3.64	4.36

Source: Vendor Interviews

Rating: 1 = Low, 10 = High

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- Added emphasis was applied to spares requirements in 1982, easily outrating all other issues where field service management has influence.

- Pricing, the sale of field service, and contractual times acceptability all affect revenue, which in turn affects profitability. All are issues that field service managers feel they now influence to a marked degree.

- The next two issues, serviceability design and site environment acceptability, affect system reliability. In 1982, serviceability design significantly increased in importance.

- Built-in diagnostics, also related to system reliability, increased dramatically in importance.

- A rating of below five underscores issues where field service management has minor influence, and a number of key field service issues are regrettably included:

    - Equipment specification.

    - Equipment design.

    - Order acceptance.

- However, all of these issues improved their rating in 1982 over 1981, showing that the necessity of involving field service management in the issues has become apparent.

4. FIELD SERVICE PERFORMANCE, 1982, AND PLANS FOR 1983

- The service provided to customers was measured for 10 categories of equipment by system availability, response time, repair time, and MTBF.

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- Current values and expectations for 1983 were obtained for each of these and (with the exception of MTBF) the vendors' own judgment of what users would accept as a minimum.

- Exhibit IV-31 summarizes the findings for system availability:

  - Users' minimum requirements are exceeded in all categories of equipment, but the performance of word processors is barely above the minimum.

  - Improvements in system availability are expected in 1983 for all categories except terminals and executive workstations, but expected improvements are also modest in minicomputers, peripherals, and DC.

  - Word processors currently have the worst system availability of all the categories of equipment analyzed.

  - Terminals are the only category where system availability is expected to decrease in 1983.

  - Users' minimum requirements are consistently around the 92% to 95% mark.

- Next, average response times were examined. Exhibit IV-32 analyzes the findings. In each case the data refer to the vendor's view, not the user's:

  - Mainframe vendors are well within the user requirements.

  - Medium mainframe vendors are under the user requirement, but expect some deterioration in response in 1983.

  - Small business system vendors, while providing the response level users want, hope to improve in 1983.

INPUT

EXHIBIT IV-31

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VENDORS' RESPONSE ON SYSTEM AVAILABILITY

EQUIPMENT CATEGORY	SYSTEM AVAILABILITY (percent)		
	CURRENT	ESTIMATE 1983	MINIMUM USER WOULD ACCEPT
Large Mainframes	97.6	98.5	95.0
Medium Mainframes	95.8	97.3	92.4
Small Business Systems	96.1	96.7	93.9
Minicomputers	95.9	96.1	92.4
Microcomputers	96.8	97.3	93.3
Peripherals	95.3	95.4	92.2
Terminals	96.7	96.6	92.8
Word Processor	94.0	95.3	93.8
Executive Workstation	95.0	95.0	92.5
Data Communications	97.0	97.3	94.3

Source: Vendor Interviews

INPUT
FA82

EXHIBIT IV-32

VENDORS' VIEW OF RESPONSE TIME

EQUIPMENT CATEGORY	AVERAGE RESPONSE TIME (HOURS)		
	CURRENT	ESTIMATE 1983	USER EXPECTATION
Large Mainframes	1.3	1.3	2.2
Medium Mainframes	2.4	2.5	2.7
Small Business Systems	2.2	2.1	2.3
Minicomputers	3.3	2.9	5.4
Microcomputers	3.1	2.8	3.8
Peripherals	6.4	7.6	8.8
Terminals	6.4	6.1	6.5
Word Processors	2.8	2.4	3.1
Executive Workstations	3.3	2.9	3.5
Data Communications	5.0	4.4	8.2

Source: Vendor Interviews

- Microcomputer service organizations are gradually improving response times and are below the average user requirement.

- Peripheral vendors are currently well below user requirements, but nevertheless anticipate some degradation of response in 1983.

- Terminals, executive workstations, and word processor vendors hope to impove response performance in 1983 from barely meeting the user requirements in 1982.

- DC vendors will continue to improve the response times that are already well below user needs.

- Lastly, vendor repair times and MTBF were examined, and Exhibit IV-33 summarizes the findings:

    - Vendors of all equipment categories expect to improve their repair times in 1983, except for DC products vendors (who had the lowest repair times in 1982).

    - Average MTBF values show no significant improvement over 1981.

5. MOST SIGNIFICANT FIELD SERVICE ACHIEVEMENTS IN 1981

- The main achievements of 1981 by the information systems field service organizations were, in order of the number of mentions:

    - The successful operation of a number of vendors as profit centers for the first time.

    - Increased emphasis on system reliability and availability.

INPUT

EXHIBIT IV-33

VENDORS' RESPONSE ON REPAIR TIME AND
MEAN TIME BETWEEN FAILURE (MTBF)

EQUIPMENT CATEGORY	REPAIR TIME (HOURS)		AVERAGE MTBF (HOURS)
	CURRENT	ESTIMATE FOR 1983	
Large Mainframes	2.2	1.4	371
Medium Mainframes	2.7	2.1	522
Small Business Systems	2.0	1.9	274
Minicomputers	1.9	1.6	525
Microcomputers	2.5	2.0	No Data
Peripherals	1.8	1.0	1,943
Terminals	1.6	1.3	2,860
Word Processors	2.4	2.1	1,000
Executive Workstations	1.9	1.5	No Data
Data Communications	1.2	1.2	22,675

- Service automation: improved logistics for spare parts, new automated dispatch systems, and the continued penetration of remote diagnostics to all vendor sizes in all equipment categories.

- Managing the rapid growth of product catalogs and installed base of system without undue impact on service quality.

- All of this was achieved along with the implementation of tighter financial controls over parts inventories and expense budgets, while absorbing a steady flow of microprocessor-based products.

- Many vendors are progressing toward centralized maintenance services, to improve control of escalation procedures for emergency situations, central dispatch, productivity, use of FE time, and overall expenditures.

- The shortage of skilled staff eased slightly, more by automation and improved productivity, than by a sudden increase in the number of trained FEs available.

- Two of the 45 interviewed vendors are considering offering TPM services in 1982 on product lines that are not in competition with their own.   This represents an obvious source of revenue growth that other vendors may need to consider in the medium term.

- Pressure is increasing for field service organizations to continue revenue growth of 25% to 35%, partially to offset revenue shortfall in equipment sales.

- Simultaneously, profit margins on field service are becoming a vital part of total company earnings.   Only three years ago field service was measured principally on a cost basis; now field service management finds itself in the hot seat for projections of company future growth and earnings.

- The U.S. recession has sharpened competition for available business resulting in equipment price reductions.   Integral to the competitive picture are

INPUT

maintenance charges which can no longer rise 15% per annum across the board.

- IBM has recognized this and in the latest round of service price increases was careful to apply only 4% increases on maintenance charges for new products; the larger 15% increase was reserved for product lines that are no longer actively sold. The net effect was a 14% overall increase in field service revenue without serious impact on new product sales.

6. MOST SIGNIFICANT ISSUES FOR THE 1982-1983 PERIOD

- Four aspects of field service dominate field service management's thinking about the next 24 months:

    - Revenue growth: where will the revenue come from to satisfy the 25% to 35% growth expected by top management?

    - Profitability: this translates into cost control for the field service manager, since he has limited control over service price increases. FS managers should strive to obtain greater influence on mainframe pricing.

    - New product introductions: to stay competitive, absorb new technology, and penetrate new markets needed for company growth, a stream of new products is being prepared.

    - Improved service: inexpensive and efficient service must be provided to customers through automated field services.

- The background for this set of ambitious goals is a down economy. Business is not good and any improvement, when it comes, will be a slow one. This is a pressure-cooker environment for companies predominantly active in slow growth or stagnant markets, such as the market for mainframes that are not IBM-compatible.

INPl

- High revenue growth areas include minicomputers, microcomputers, application software, office automation, and network products. For many of the mainframe vendors this is not an easy change. Most have begun efforts to establish themselves in these markets, but few can expect the revenue volume from these sources to immediately offset slowing revenue growth from traditional mainframe business.

F.   VENDOR CASE STUDIES

1.   OFFICE PRODUCTS MANUFACTURER

a.   Introduction

- The company has sales over $400M and manufactures word processors, workstations, terminals, and peripherals for office systems markets.

- Seventy percent of maintenance services are provided through 117 branch offices and the remaining 30% is achieved through distributors.

b.   Field Service Operations

- Of a total of 6,600 employees, 28% are engaged in field service, of which 1,500 are FEs.

- Few customer sites have resident engineers and remote diagnostics are not used. Five percent of engineers work from home.

- Field service revenue in 1982 will be $65.6M (20% of total company revenue) with a loss on operations of $1.2M. Revenue per engineer is only $3,600 per month and is projected to rise in 1983 to $3,900 per month. The loss on field service revenue will then narrow to $0.9M.

INPUT

- A high proportion (16%) of engineers were lost in 1981-1982 and only one-third were replaced by new hires.

    c.   Field Service Performance

- Field service management concentrated on five major action items in 1981 and 1982:

    - Availability of parts.

    - Quality of service.

    - Preventive maintenance.

    - Equipment reliability.

    - Profitability of operations.

- Maintenance through distributors (with the company acting as a parts wholesaler and FE training school) was considered a success.

- The company is concentrating on product quality, equipment serviceability design, and on spares requirements levels, on the one hand, and marketing/pricing of field service on the other, to narrow the profitability gap.

- No intensive effort is being made on diagnostics, user education, or control of geographic dispersion of equipment sales.

- Response times averaging 2.5 hours in 1982, are gradually being reduced to two hours. System availability is expected to be 95% by 1983.

    d.   Cost Tracking And Field Service Pricing

- Costs are tracked at the product level and all spares are expensed over a seven-year period.

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INP

- Field service pricing is constructed on the basis of costs, but bearing in mind competitors' pricing for similar services in competitive product markets.

e. Principal Issues, 1981-1982

- Field service revenue is growing faster than any other part of the company's business and has therefore suddenly become much more important. The concern now is how to continue that growth and produce a profit.

- Productivity of the individual FE is now being carefully measured and, at the same time, the level of customer satisfaction is being assessed.

2. MINICOMPUTER MANUFACTURER

a. Introduction

- The company has sales in excess of $250M and manufactures minicomputer-based distributed processing products. Initially these were aimed at information processing markets, but more recently office automation has been addressed including the office network.

- Field service has grown steadily in importance and now produces 23% of company revenue.

b. Field Service Operations

- Of a total of 4,600 employees, 24% are employed in field service, of which 660 are FEs. A high proportion (11%) of these work from home.

- One hundred sixty spares holding centers service the customer base.

- Field service revenue in 1982 will be $70M in 1982 and produce a 10% profit.

INPUT

- Revenue per engineer is $8,800 per month, far in excess of the 1982 industry average.

- Labor turnover was low in 1981 (less than 2%), easily offset by new hires. This resulted largely from competitive compensation.

c. Field Service Performance

- Field service management successfully focused on four main concerns in 1981-1982:

    - Response time (reduced to 3.5 hours and still decreasing).

    - System availability (98% achieved).

    - Stability of engineer population (already mentioned).

    - Cost savings and productivity (high per FE revenue).

- The key customer engineer and first line management measurement is customer satisfaction/quality of service, assessed by a regular customer survey.

d. Cost Tracking And Field Service Pricing

- Costs are controlled by product, within product line, and by field service branch office.

- Spares are expensed if they cost less than $75 and inventoried over that threshold. A five-year spares life expectancy is applied.

- Field service is priced lower than the competition and costs are then rigorously controlled to fit within the revenue framework thus created.

INP

e.   Principal Issues, 1981-1982

•   The company says it could not afford to supply service without its dispatch center and the hardware and software support centers that it operates, although no quantifiable benefit can be measured from the use of them. Also, believing that remote diagnostics are an economic necessity for the future, the company is planning accordingly.

•   Like many other field service organizations, increased field engineering profit potential has become a dominant concern in the company. As a result, attention is being placed on reducing the labor component of costs through the use of:

-    Remote diagnostics.

-    Higher reliability products.

-    Faster troubleshooting/repair.

-    Simplified training for lower skilled/trainee FEs, as skills requirements decrease.

3.   TERMINALS MANUFACTURER

a.   Introduction

•   The company is a small, $40M supplier of "smart" (i.e., factory programmable) video display terminals, primarily to the OEM market.

•   To date it has shipped over 100,000 terminals to 41 countries and has begun purchasing its distributors in the main non-U.S. markets, to gain visibility in end user markets.

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INPUT

b. Field Service Operations

- Of 500 employees, 10% were dedicated to field service, 99% at headquarters.

- Support consists of 200 spares holding centers worldwide, stocked with parts whose value is capitalized at purchase or assembly cost, depreciated over four to seven years.

- Field service revenue in 1982 will by $3.5M (8% of total company revenue), producing a profit of 15%. Revenue per engineer will be a low $5,400 with little improvement expected in 1983.

- Labor turnover was insignificant in 1982, and a small number of new hires were made. This same pattern is expected in 1983.

c. Field Service Performance

- In 1981-1982 management paid most attention to response time, repair time, and equipment reliability. These must be viewed in the context of remote support by third-party OEMs and distributors.

- Management believes it was most successful at improving product quality in 1981 and in living within budget limitations.

- Field service management had most influence over equipment serviceability design, built-in diagnostics, and in selling/pricing of field service.

- All of the above are consistent with support of OEMs as the first line customer service suppliers.

d. Cost Tracking And Field Service Pricing

- Costs are tracked on a site-within-customer basis.

INPl

- Service prices are developed as a fixed percent of sales value (e.g., 1.8% of sales value per month in 1981) adjusted to allow for fully burdened costs if necessary.

e. Principal Issues, 1981-1982

- The company is instituting 16 centralized support centers and a fully automated dispatching system to improve customer support and reduce parts shortages.

- In addition each regional line manager will be measured against his own P/L target.

- The main 1982-1983 target is to insure the availability of enough fully qualified field support staff to implement their new support center policy.

4. PERIPHERALS MANUFACTURER

a. Introduction

- The company manufactures printers for use with small business systems and minicomputers. The products are sold worldwide to OEMs and computer manufacturers through a network of 45 distributors.

- The company had sales of approximately $60M in fiscal 1982 with a workforce of 1,200 employees. Only 14 of these were employed in field service.

b. Field Service Operations

- Field service revenue (i.e., that collected by the headquarters, as opposed to revenue to the distributors), was $3M, or 5% of total company revenue in 1982. This was principally the sale of spare parts.

- A profit of 30% was realized on this revenue.

INPUT

- Products are sold in a variety of environments with an even distribution:

  - Forty percent in DP rooms.

  - Thirty percent in offices.

  - Thirty percent in plant/factory environments.

- The field service staff is principally supervisors and senior FEs. No trainees are employed and there are no support centers or remote support capabilities for the distributors who are the front line service suppliers.

c.   Field Service Performance

- Field service management concerned itself principally with equipment reliability in 1981-1982. This focused on automated production tools and capital investment for quality control equipment.

- This will be the main area of concern again in 1983.

- Management believes that, in 1982, it successfully reduced labor turnover, kept in-house engineering staff up to date with product development, and supported remote distributors.

- Management felt that it had exerted the greatest influence over spares requirements levels, selection of test equipment, and pricing of field service, both in 1981 and 1982.

d.   Cost Tracking And Field Service Pricing

- Costs are tracked at the product level, within product line.

- Parts are expensed below $40 and inventoried over this threshold, with a five-year life expectancy applied.

INPU

- Maintenance prices are a straight percentage of sales value, currently 18%.

e. Principal Issues, 1981-1982

- The company is launching its first intelligent (microprocessor-based) printer, which is a major departure from all other products up to now.

- Troubleshooting these products is an unknown at this stage, since no first-hand field experience is available. Consequently, there is general concern at how these products can be handled.

- Two further issues are expected to become important over the next 24 months:

  - Customer demand for shorter response time (an issue which cannot be controlled directly by the company, only through distributors).

  - An in-house drive for more accurate costs versus revenue projections and controls.

5. DATA COMMUNICATIONS MANUFACTURER

a. Introduction

- The company manufactures a complete range of data communications products and systems, including modems, multiplexors, network administrators, distributed data processing systems, and data encryption devices.

- Sales for 1982 are expected to be slightly below one-quarter billion dollars.

- For the domestic market, wholly-owned service offices provide direct user maintenance for all product lines. Non-U.S. markets have been serviced primarily by distributors and OEMs, but the company continues to expand its own end user marketing and service activities in all major markets.

INPUT

b.   Field Service Operations

- Of the 2,900 employees, 477 are in field service, and of these 353 are engineers.

- All the engineers in the domestic market have access to remote diagnostics, supported by 24 spares holding centers.

- Seventy-five major user sites have a resident engineer, and 12% of all engineers work out of their own homes.

- Only 26% of field service staff are at headquarters, but 20% of all engineers at any one time are on training courses.

- Field service revenue in 1982 is estimated at $24M; operations will break even.

- Ten percent of engineers are lost each year through attrition and replacements are hired. In addition to this turnover, the service force has been doubled each year for the last three years.

c.   Field Service Performance

- A host of issues received specific field service management attention in 1981, including:

    - Preventive maintenance.

    - System availability.

    - Response time.

    - Repair time.

    - Escalation procedures.

INP

- Equipment reliability.

- Price of maintenance.

- Budget control.

- Of these the successful actions include improving product quality and improving the level of maintenance of all field products.

- Labor turnover was also reduced and a successful recruiting program initiated.

- Field service management has no say in establishing built-in diagnostics (engineering has control), selling of field services (marketing), acceptability of site environment (sales), or geographic marketing of products ("they don't listen to me at all").

- However, individual order acceptance is under the field service manager's control ("If I don't want it shipped it does not go.").

d.   Cost Tracking And Pricing

- Costs are tracked only at district office level. Apparently it is sufficient for field services to expand at a rate compatible with sales, with emphasis on cost control, not profit.

- Principal cost element is travel; despite the use of remote diagnostics, an on-site visit is nearly always necessary.

- Pricing is based on costs and a certain element of competitive analysis.

e.   Principal Issues, 1981-1982

- Growth is the principal issue for the company. Coping with an organization that is doubling in size each year while maintaining standards of performance is not an easy task.

INPUT

- The breakdown of customer contracts is:

  - Eighty-nine percent of clients on standard contracts.

  - Ten percent of clients on time and materials.

  - One percent of clients serviced by OEMs, who only purchase spares.

- Over the next 24 months the priorities are:

  - Cost control.

  - Client satisfaction.

  - Expansion of field service organization to support company growth and client satisfaction.

6. LARGE TURNKEY VENDOR

   a. Introduction

- The company supplies dedicated systems to selected U.S. vertical markets and has shipped over 3,000 such turnkey systems.

- Revenue for fiscal 1981 was over $75M, and is expected to top $90M in 1982.

- Margins have deteriorated due to discounting (to encourage purchase in a poor economy) and the company's insistence on continued expansion (12%) of the sales force.

   b. Field Service Operations

- Of 1,100 total employees, 300 are engaged in field service and 240 of these are FEs.

INPU

- There are 152 branch offices and only two spares holding centers.

- One hundred fifteen customer sites have resident engineers.

- All software (system and application) and hardware maintenance is included in a single maintenance contract.

- On revenue of $19M, field service produced a profit of 20% before tax.

- Net engineer new hires represented an increase of 30% of the total engineer employment in 1981.

  c.   Field Service Performance

- In 1981, management's attention was directed at:

  -    Production of a profit.

  -    Stability of the engineer population.

  -    The price of maintenance.

- A secondary set of problems that required attention was:

  -    Purchasing and second-sourcing components.

  -    System availability.

  -    Escalation procedures.

  -    Uptime guarantees.

INPUT

- Of these, management believes it was most successful in stabilizing the engineer population (mainly by providing competitive salaries). Field service marketing also improved in 1981.

- Field service has no control over the geographic dispersion of product or on order signoff ("marketing shoots the shotgun and wherever the bullets land, that's where we install").

- Field service also has no or little involvement in equipment specification, design or built-in/other diagnostics. Control has been gained in the pricing and selling of field service, however.

  d.   Cost Tracking And Pricing

- Costs are tracked at the product line level (this means a given turnkey combination of system/application software and hardware.

- Parts are inventoried and depreciated if the company manufactures them or expensed if the company purchases them.

- Average parts life expectancy is three to five years.

  e.   Principal Issues, 1981-1982

- In an effort to continue expansion of sales and revenue, the company has begun acquiring other similar organizations. This has led to the sudden appearance (through acquisition) of a group of customers spread over a wide area with insufficient FE coverage.

- This pattern will continue, so that field service must now grow in sudden leaps. Also field service has become an operating division of the company with products, services, and profit goals like any other.

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7. SMALL SYSTEMS MANUFACTURER

a. Introduction

- The company manufactures small business systems, word processors, mini-computers, and microcomputers and imports them to the United States.

- Sales for 1981 were over $220M and total U.S. employment over 3,000 people.

- The company handles its own field service, with the exception of word processors where dealers and distributors provide their own service.

b. Field Service Operations

- Over 500 people provide field service, of which 425 are field engineers.

- There are 24 branch offices supported by a single spares holding center.

- Less than 5% of engineers work at home, and an equal number are resident at the user site.

- Field service revenue was approximately $39M and operated at a small loss. Field service is viewed as a support service for business sales, not as a business in its own right.

- In excess of 10% of the engineer workforce was lost and replaced in 1981, and the proportion is rising.

c. Field Service Performance

- The principal target for management attention in 1981 was system availability, followed by response time.

INPUT

- The majority of other key maintenance issues were not a part of management's concern or responsibility: the role played by field service is subservient and narrow.

    d.   Cost Tracking And Pricing

- Costs are tracked at product line level.

- Parts that are expendable are expensed and those that are repairable are inventoried. This usually corresponds to a part cost of $100.

- Service pricing is based on costs, but a watch is kept on the percentage of sales price this represents to insure it is in line with competition.

    e.   Principal Issues, 1981-1982

- Astonishingly for a company with such a rigid view of the role of field service, the company has launched itself into TPM (no doubt in an attempt to improve revenue and productivity).

- This same company declares it has only gotten into automated dispatch because several accounts required it in conjunction with 24-hour service.

- Yet third-party maintenance contracts have not been long in coming, a clear indication of the demand for these services.

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APPENDIX A: USER QUESTIONNAIRE

USER QUESTIONNAIRE

A. GENERAL

1. What is the principal business of your firm?

_____

_____

2. What do you consider to be your top three EDP problems (with "1" being the most serious)? What action do you intend to take to resolve them?

PROBLEM		ACTION	
1.			
2.			
3.			

3. Please indicate the number of mainframe and minicomputer systems installed and on order; also indicate current and planned operating systems.

NUMBER		VENDOR NAME	MODEL NUMBER	OPERATING SYSTEM
INSTALLED	ON ORDER			

INPUT

B. MAINTENANCE

4. Where is the equipment located that EDP is responsible for maintaining?

☐ In a computer room _____ %

☐ In a general office environment _____ %

☐ In a plant or factory _____ %

☐ Other _____ %

Total _____100_ %

5. Who supplies you with maintenance service? Please rate them.

VENDOR	High	Medium	Low

6. What type of maintenance plans do you use? (check as many as apply) ☐ Contract 2 hr. ☐ Contract 4 hr. ☐ Contract 8 hr. ☐ Repair depot ☐ Time and materials ☐ Other: _____

7. In evaluating maintenance, how important is each of the following criteria?

Maintenance For	CRITERIA (Circle: 1 = Low Importance, 5 = High Importance)				
	Cost	Uptime (System Availability)	Response Time to Repair	Vendor Reputation	Other _____
Hardware	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Software	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

8. How extensive has your experience been in using third party maintenance (i.e., by an organization other than original vendor) and how satisfied have you been? Do you expect to increase your use of third party maintenance?

	MAINTENANCE AREA (Circle: 1 = Low, 5 = High)					
	CPUs	Peripherals	Office Equip.	Terminals	Communications Equipment	Software
Amount of experience	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Satisfaction	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Likelihood of increased use	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

9. Do you receive and act on purchasing suggestions by vendor maintenance personnel? (Circle: Y = Yes, N = No, DK = Don't know)

	New Systems	Peripherals	Communications	Software	Supplies
Receive suggestions	Y N DK	Y N DK	Y N DK	Y N DK	Y N DK
Act on them	Y N DK	Y N DK	Y N DK	Y N DK	Y N DK

INPUT

C. SOFTWARE MAINTENANCE

10. What is the approximate number of programs being actively maintained?

_____ Lines of code? _____

11. How much of your purchased software do you maintain yourself? ☐ None   ☐ Some   ☐ Most   ☐ All
    Why?_____

12. Does the central EDP organization supply applications software maintenance?
    ☐ None ☐ Some ☐ Most ☐ All

13. What percent of your applications analysts and programmers were/are/will be assigned to the maintenance of existing programs in:

    1981 _____%,   1982 _____%,   1983 _____%.

14. In your opinion, during the next three years what is the likelihood of there being significantly greater productivity in maintaining existing software.

LIKELIHOOD IN YOUR COMPANY/DIVISION			LIKELIHOOD IN YOUR INDUSTRY			LIKELIHOOD IN EDP GENERALLY		
LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH

D. EDP EXPENDITURES

15. Please categorize your 1982 EDP budget and indicate the expected change for 1983.

CATEGORIES	1982 EDP BUDGET AMOUNT	ANTICIPATED PERCENT CHANGE IN 1983		
		Increase	Decrease	Percent
Mainframe processors	$			%
Minicomputers	$			%
Microcomputers/ personal computers	$			%
Terminals	$			%
Peripherals	$			%
Communications hardware and software	$			%
Software maintenance	$			%
Hardware maintenance	$			%

INPUT

16. What is your annual hardware maintenance budget for:	CPU		PERIPHERALS		COMMUN. EQUIP. TERMINALS		OFFICE EQUIP./ WORD PROC.	
	Purchased	Leased/ Rented	Purchased	Leased/ Rented	Purchased	Leased/ Rented	Purchased	Leased/ Rented
Internal (in-house) maintenance	$	$	$	$	$	$	$	$
External (vendor) maintenance								
• Provided by manufacturer	$	$	$	$	$	$	$	$
• Provided by third party	$	$	$	$	$	$	$	$

E.   PERSONAL COMPUTERS/SMALL BUSINESS SYSTEMS (Stand Alone System Costing Under $15,000)

17.   Are there personal computers installed in your organization:

☐ Yes   Number _____

☐ No

18.   In deciding to purchase personal computers/small business systems how important is each of the following criteria to the EDP department and to user departments? (1 = low, 5 = High)

CRITERIA	IMPORTANCE (Circle)	
	TO EDP	TO USERS
Maintenance Cost	1 2 3 4 5	1 2 3 4 5
Service Availability	1 2 3 4 5	1 2 3 4 5
Hardware Reliability	1 2 3 4 5	1 2 3 4 5

THANK YOU FOR YOUR TIME

INPUT

APPENDIX B: VENDOR QUESTIONNAIRE

U.S. FIELD SERVICE VENDOR SURVEY 1982

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1. STAFFING LEVELS	1982	1983
Employees in company		
Number in field service		
Number of field engineers		
Number of technical support engineers		
Number of field service administrators		
Number of field service supervisors		
Number of field service line managers		

2. ORGANIZATION	1982	1983
Number of branch offices		
Number of sites with resident engineer		
Number of sites using remote diagnostics		
Number of spares holding centers		
Percent of staff at headquarters		
Percent of staff on training courses		
Percent of engineers working from home		

3. FINANCIAL	1982	1983
Field service revenue		
Field service budget		
Profit percentage before tax	%	%
Revenue per engineer		
Fully burdened cost of engineer		
Charge out hourly rate for engineer		
Percent field service revenue of total company revenue		

INPUT

4. SALARY INFORMATION	DOLLAR RANGE		AVERAGE SALARY	PERCENT INCREASE		TRAINING INVESTMENT VALUE
	FROM	TO		1981	1982	
Trainee						
Qualified Field Engineer						
Senior Field Engineer						
Hardware Support Engineer						
Software Support Engineer						
Supervisor						
Line Manager						

5. DISTRIBUTION BY ENVIRONMENT			
EQUIPMENT CATEGORY	PERCENT DP ROOM	PERCENT OFFICE	PERCENT PLANT/ FACTORY
Mainframe Systems			
Small Business Systems			
Minicomputers			
Microcomputers			
Word Processors			
Executive Workstation			
Peripherals			
Terminals			
Data Communications			

6. COST BREAKDOWN OF A TYPICAL FAULT CALL		
COMPONENT	1982	1983
Average Cost ($)		
Direct Labor (Percent)		
Travel Labor (Percent)		
Parts and Material (Percent)		
Travel Expense (Percent)		
Burden and Over- head (Percent)		
Average Number of Calls Per Week/ Per Engineer		

INPUT

7. How do you set your maintenance charges (e.g., percent of sales value, based on costs, etc.)?

_____

_____

_____

8. LABOR TURNOVER	1981	1982
Number of Field Engineers Lost		
Number of Field Engineers Gained		

9. What are the major reasons for losing engineers?

_____

_____

_____

10. Please rate the following in terms of the amount of field service management attention paid to them in 1981, and your plans for 1982 in this regard (1 = Low, 10 = High)

AREA	1981 RATING	1982 RATING
• System Availability		
• Response Time		
• Repair Time		
• Preventive Maintenance		
• Remote Maintenance		
• Escalation Procedure		
• Price of Maintenance		
• Stability of Engineer Population		
• Uptime Guarantees		
• Equipment Reliability		
• Support Centers		
• Software Maintenance		
• Flexible Contracts		
• User Self-Maintenance		
• Other _____		
• Other _____		

INPUT

11. Please rate your success at implementing the following during 1981: 1 = Low, 10 = High P = Planned, I = Implemented/no data N = Not implemented	RATING
Recruiting of Field Service Engineers	
Training of Field Service Engineers	
Reducing Labor Turnover	
Improving Product Quality	
Making Adequate Diagnostic Equipment Available	
Providing Adequate Remote Diagnostic Assistance	
Meeting Customer Demands	
Living with Budget Limitations	
Providing Competitive Salary/Compensation	
Reducing Spare Parts Shortages	
Improving FE Technical Competence	
Marketing Field Service	
Maintenance Through Distributors	
Maintenance of Data Communications Equipment	

12 Please rate the field service involvement and influence in the following issues. 1 = Low 10 = High	1981	1982
Equipment Specification		
Equipment Design		
Equipment Serviceability Design		
Built-in Diagnostics		
Other Diagnostics		
Selection of Test Equipment		
Spares Requirements and Levels		
Geographic Marketing Control		
Order Acceptance Sign-Off		
Contractual Terms and Conditions		
Acceptability of Site Environment		
User Education		
Selling of Field Service		
Pricing of Field Service		

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INPUT

13. MAINTENANCE PRICING EQUIPMENT CATEGORY	PURCHASE VALUE OF YOUR EQUIPMENT	MONTHLY MAIN- TENANCE CHARGE	CONTRACT RESPONSE TIME	CONTRACT PERIOD OF NOTICE OF INCREASE	PERCENT INCREASE IN LAST 12 MONTHS	FORECAST INCREASE EXPECTED IN NEXT 12 MONTHS	PERCENT INCREASE THAT WOULD BE UNAC- CEPTABLE	T&M HOURLY CHARGE FOR AN ENGINEER
Large Mainframe Systems								
Medium Mainframe Systems								
Small Business Systems								
Minicomputers								
Microcomputers								
Peripherals								
Terminals								
Word Processors								
Executive Workstation								
Data Communications								
Systems Software								
Applications Software								

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14. FIELD SERVICE PERFORMANCE

EQUIPMENT CATEGORY	SYSTEM AVAILABILITY (PERCENT)			MAINTENANCE AVERAGE RESPONSE TIME IN HOURS			MAINTENANCE AVERAGE REPAIR TIME IN HOURS			AVERAGE MEAN TIME BETWEEN FAILURES (HOURS)	NUMBER OF NO FAULT FOUND (PERCENT)	NUMBER OF REPEAT CALLS (PERCENT)
	CURRENT	ESTIMATE IN 1983	MINIMUM YOUR USER WOULD ACCEPT	CURRENT	WHAT DOES YOUR USER EXPECT	WHAT DO YOU HOPE TO ACHIEVE IN 1983	CURRENT	YOUR ESTIMATE FOR 1983	AFTER WHAT TIME DOES ENGINEER CALL FOR ASSISTANCE			
Large Mainframe Systems												
Medium Mainframe Systems												
Small Business Systems												
Minicomputers												
Microcomputers												
Peripherals												
Terminals												
Word Processors												
Executive Workstation												
Data Communications												
Systems Software												
Applications Software												

INPUT

15. Do your field service revenues include revenues from the following?
    (☑ or percent if possible)

    ☐ Hardware maintenance   ☐ Systems software maintenance

    ☐ Applications software   ☐ Training/documentation
         maintenance

                                         ☐ Equipment relocation

    ☐ Installation fees

    ☐ Spares   ☐ Supplies (e.g., ribbons, disk
                                         packs, etc.)

    ☐ Credits from sales for special maintenance conditions.

    ☐ Other (please specify) _____

16. Do you operate field service P & L control at ☐ branch, ☐ district,
    ☐ regional, ☐ headquarters level, or ☐ cost/budget control?

17. Can you quantify the benefits versus costs of the principal new field
    service programs? (e.g., Remote Diagnostics, Support Centers,
    Automated Dispatch, etc.)

    _____

    _____

    _____

    _____

    _____

18. What key indicators or measurement techniques are used to control CE/
    first line managers?

    _____

    _____

19. Do you offer reductions in standard maintenance contract prices for
    different delivery modes?

	YES	NO	PERCENT
Carry in/mail in:	☐	☐	☐
User self-maintenance:	☐	☐	☐
Device swap-out:	☐	☐	☐
Other (_____):	☐	☐	☐
Other (_____):	☐	☐	☐

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20. To what level do you track costs and revenues?

☐ Site ☐ Customer ☐ Product ☐ Product line ☐ Other _____

21. With regard to spare parts, do you:

☐ Expense low-cost parts (less than $_____)?

☐ Inventory parts over $_____?

22. What life expectancy do you apply to spares?

_____

23. Who is responsible for marketing and sales of field service products and contracts?

☐ Field service organization   ☐ Sales organization

☐ Both involved   ☐ Other (_____)

24. In your view what was the most significant field service issue or development in 1981 (i.e., in your organization and/or in other field service companies)?

_____

_____

_____

_____

25. What will be the most significant issue in the next 24 months? (as for 24)

_____

_____

_____

THANK YOU

The time you have spent with us is appreciated. If you would like to know more about INPUT's research programs and are not already a client, please check here ☐ .

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APPENDIX C: INDUSTRY SECTOR DEFINITIONS

APPENDIX C

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Discrete Manufacturing	23	Apparel
	25	Furniture
	27	Printing
	31	Leather
	34	Metal
	35	Machinery
	36	Electronics
	37	Transportation
	38	Scientific and Control Instruments
	39	Miscellaneous Manufacturing
Process Manufacturing	10	Metal Mining
	11	Anthracite Mining
	12	Coal Mining
	13	Oil and Gas Extraction
	20	Food Products
	21	Tobacco
	22	Textile Products
	24	Lumber and Wood Products
	26	Paper Products
	28	Chemicals
	29	Petroleum
	30	Rubber and Plastics
	32	Stone, Glass, Clay
	33	Primary Metals

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Transportation	40	Railroads
	41	Local Transit
	42	Motor Freight
	43	U.S. Postal Service
	44	Water Transportation
	45	Air
	46	Pipelines
	47	Transportation Services
Utilities	48	Communications
	49	Electric, Gas, & Sanitary
Banking and Finance	60	Banks
	61	Credit Agencies
	62	Security and Commodity Brokers
	67	Holding and Investment Offices
Insurance	63	Insurance (Life, Health, Etc.)
	64	Insurance Agents
Medical	80	Health Services

INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Education	82	Educational Services
Retail	52	Building Materials, Hardware
	53	General Merchandise
	54	Food
	55	Automotive and Gas Stations
	56	Apparel
	57	Furniture
	58	Eating and Drinking
	59	Miscellaneous Retail
Wholesale	50	Durable Goods
	51	Non-Durable Goods
State and Local Government	91-97	As Appropriate
Federal Government	91-97	As Appropriate
Services	73	Business Services

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INDUSTRY SECTOR DEFINITIONS

INDUSTRY SECTOR	INDUSTRY SIC	INDUSTRY NAME
Other Industries	01-09	Agriculture, Forestry, and Fishing
	15-17	Construction
	65	Real Estate
	66	Combinations of Real Estate, Insurance, Loans, Law Offices
	70	Hotels, Rooming Houses, Camps, and Other Lodging Places
	72	Personal Services
	75	Automotive Repair, Services, and Garages
	76	Miscellaneous Repair Services
	78	Motion Pictures
	79	Amusement and Recreation Services, Except Motion Pictures
	83	Social Services
	84	Museums, Art Galleries, Botanical and Zoological Gardens
	86	Membership Organizations
	89	Miscellaneous Services

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